VOL. XXXI NEW YORK—THURSDAY, NOVEMBER 5, 1914—CHICAGO No. 19

The Automobile

Motor Fortune Wheel in War

No French Factories Destroyed—The Ideal War Truck —Medium-Sized Cars Best—The Rotary Motor Passes

By W. F. Bradley

Special Representative of THE AUTOMOBILE *with the Allied Armies in France*

PARIS, Oct. 16—On the day the Paris automobile salon should have been opened in the Grand Palais, this building was officially inaugurated as a hospital for wounded soldiers. The automobile industry was represented by Marquis de Dion, of the De Dion-Bouton Co. Since the war broke out continuous use has been made of the Grand Palais for military purposes. For several weeks it formed an admirable central garage for cars used as a reserve of the headquarters staff. Later it was used as barracks for the marine fusiliers now stationed in Paris, and has finally been fitted up for hospital purposes.

War Incidents in France

Not a French factory has been destroyed so far.

After the war the demand will be for medium-sized cars.

The close of the war will be the truck makers' opportunity.

Many French factory organizations are still kept intact.

Organization of Belgian accessory firms entirely disrupted.

A motor convoy under fire is in less danger than horse-drawn wagons.

The ideal motor truck for war is one with a 2½ to 3-ton capacity and four-cylinder motor of 3¾ to 4-inch bore.

Trucks must have clearance, sprags, towing hooks, four-speed gearbox and interchangeable carbureters and magnetos.

Drain cocks are necessary in cylinders and radiators.

Four-wheel-drive tractors best for artillery work.

Eight-cylinder motors are preferable in aeroplanes.

English furnish best ambulances for field work.

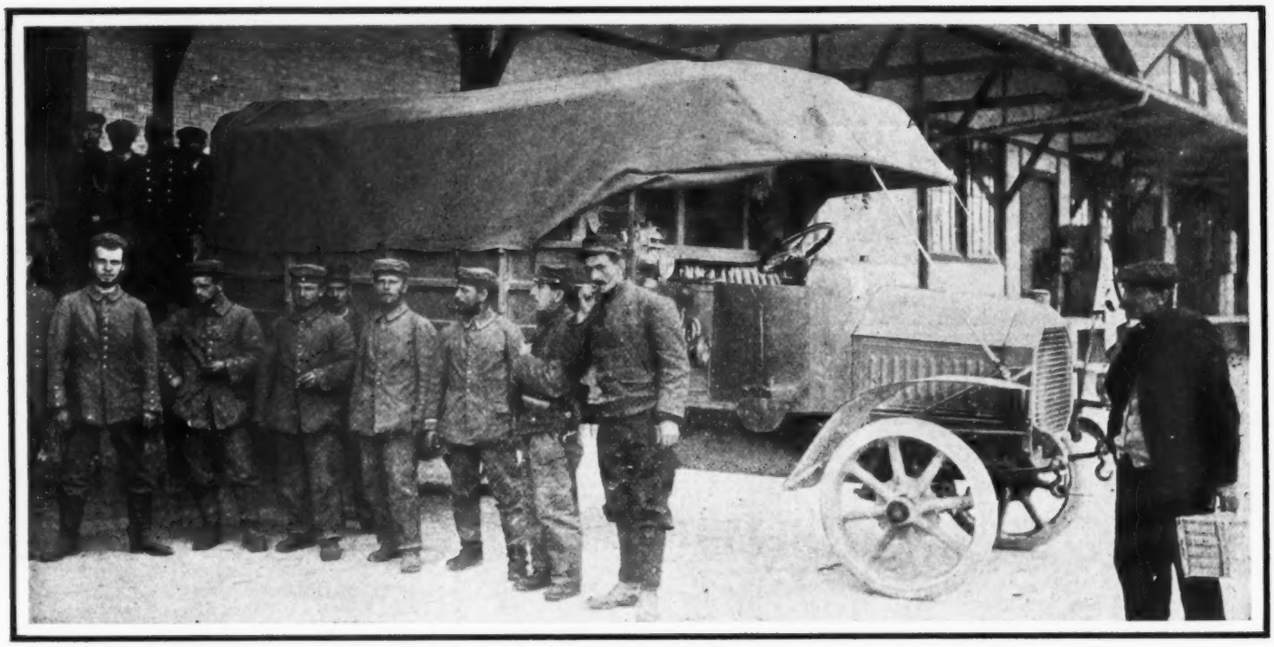
Not a Car Sold

The general situation in France may be summed up in the remark made to me to-day by the sales manager of one of the leading French car manufacturing firms: "Since first of August we have not sold or delivered a single automobile." He explained that they had partially or fully paid for cars in their shops, but customers would not take possession of them. While it was doing no business in touring cars, this firm was meeting overhead charges by doing such work for the government as making bombs, aeroplane arrows, machine-gun fittings, etc.

This factory is typical of scores in France. There are certain cases in which the war has had no prejudicial influence on automobile firms. The names of several firms might be mentioned from whom the entire stock has been requisitioned by the army authorities, payment being made partly in cash and partly in notes payable after the war. With the entire stock gone, the factory has been shut down entirely and all expense arrested.

No Longer a Luxury

This is sufficient to show that the war does not neces-



German prisoners being transferred from train to motor truck on their way from the front in France

sarily mean ruination for automobile firms. The tendency to look upon automobiles as a luxury is a mistake which has been clearly revealed during the last 2 months. Manufacturers of articles of luxury have their entire stocks on their hands. Manufacturers of automobiles have been able to clear out their stocks, and if they are not replacing them they are at any rate able to do some useful work for the war department.

THE OPINION IS GROWING AMONG MEMBERS OF THE TRADE THAT THERE WILL BE A RAPID PICK-UP AT THE END OF THE WAR. THE WASTAGE OF CARS IN THIS WAR IS GREAT; THE WASTAGE OF HORSES IS ENORMOUS.

It is only necessary to travel through the country occupied by the armies to realize how the life of cars and trucks is being shortened by rough work and inability to carry out repairs and adjustments at the appropriate time. As to the horses, the shallow trenches in which they are buried, the heaps of them left around unburied and the skeletons on four legs testify to the destruction being wrought among them.

It takes 5 years to breed horses. It takes a few months to produce quantities of cars. There will be a serious shortage of both horses and cars when this grim war comes to a close. The former shortage cannot be met immediately; the latter can. The obvious conclusion is that there will be a big demand for all types of automobiles.

The Truck's Opportunity

IN THE COMMERCIAL FIELD, WHERE TRUCKS WERE FORMERLY USED, THEY WILL BE FOLLOWED BY TRUCKS. THIS IS OBVIOUS. WHERE HORSES WERE EMPLOYED THERE WILL BE EVERY REASON TO REPLACE THEM BY MECHANICAL TRACTION. THE CLOSE OF THE WAR WILL BE THE TRUCK MAKER'S OPPORTUNITY.

It must not be supposed that every vehicle driven by gasoline is going to be accepted by Europe when the guns are silenced. The small cheap car trade is bound to suffer. Those persons who by a little economy have been able to secure for themselves the luxury and convenience of an automobile will undoubtedly forego this mode of locomotion for a certain length of time at any rate. THE GREAT DEMAND WILL BE FOR MEDIUM-SIZE CARS.

BIG HEAVY CARS OF COSTLY MAINTENANCE WILL BE A DRUG ON THE MARKET. FOR SEVERAL YEARS THE EUROPEAN MOTORIST HAS PAID ATTENTION TO THIS QUESTION OF CAR ECONOMY, AND THE WAR WILL ONLY SERVE TO DRIVE HOME THE TRUTH THAT MOTORING MUST NOT BE COSTLY.

Factory Organizations Intact

The main question is, will the factories of Europe be able to meet the demands likely to be made on them. Every manufacturer has been and is doing his best to keep his organization intact. Up to the present the manufacturers of France and England have succeeded. The German invasion has not yet touched the French motor car area.

AT THE TIME OF WRITING NOT A SINGLE FRENCH MOTOR CAR FACTORY HAS BEEN DESTROYED OR EVEN DAMAGED.

Parts Area Suffers

Probably the same cannot be said of Belgium. Unfortunately, also, the various industries on which the automobile manufacturer has to depend have suffered more than the automobile industry itself. The whole of the north of France and a considerable portion of Belgium supply steel and iron castings, forgings, steels and raw materials for the French and British automobile trades.

I have information of several firms having sent

thousands of dollars worth of patterns into Belgium and Germany before the war and now faced with the loss of this valuable material. As in most cases, it will be impossible to regain possession of these patterns; new ones will have to be made. A busy time for pattern makers is certain.

A REVIEW OF THE SITUATION AT THE PRESENT TIME FORCES TO THE CONCLUSION THAT THE RAPIDITY OF THE PICK-UP WILL DEPEND MORE ON THE SUPPLY FIRMS THAN ON THE AUTOMOBILE MANUFACTURER PROPER.

It is interesting to note what influence this war will have on war equipment. With a really decisive result, the probability must not be overlooked of an all-round diminution of armaments—a throwing off of the burden of militarism under which Europe has so long groaned. This will only modify the extent and not the nature of the change in military equipment. Cavalry will not be affected by the automobile; but every other army service has already been completely transformed by mechanical transport.

In the army service corps horses are still being employed for bringing up food and ammunition, but their services would be dispensed with if it were possible to do so at once.

Horses Not Needed

WITH THE ALLIED TROOPS I HAVE SEEN HORSES STANDING IDLE DAY AFTER DAY—GOOD HORSES DRIVEN BY MEN WHO KNEW THEIR BUSINESS—WHILE THE MOTOR TRUCKS WERE KEPT ON A DAY AND NIGHT SERVICE. IT HAS BEEN CONCLUSIVELY PROVED THAT HORSES ARE NOT NECESSARY, INDEED THAT THEY ARE PREJUDICIAL TO THE BEST WORK OF AN ARMY SERVICE CORPS IN THE FIELD.

Officers, with a blind faith in horseflesh, have been very slow to admit this. The old argument was put forth that motor vehicles would break down and for lack of some little screw, nut or bolt would be entirely lost. Spare horses, on the other hand, could always be had, and if an animal went lame it would quickly be replaced.

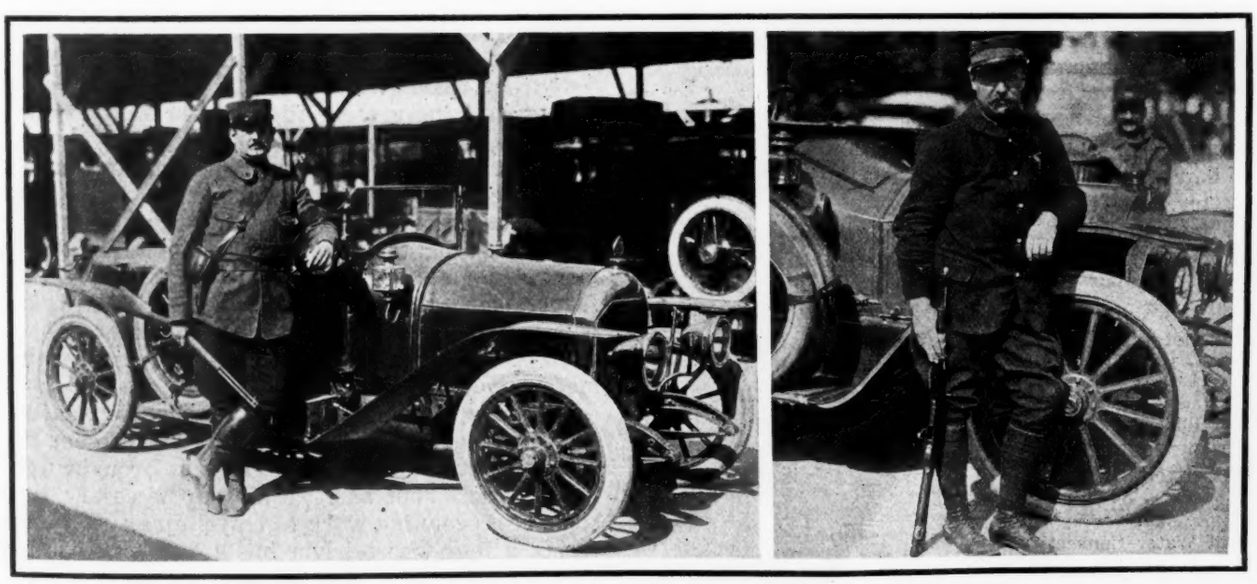
Thus, at the opening of the war the arrangements were for motor trucks to carry ammunition and food from the railhead to a point a certain distance back of the firing line and make the final distribution by means of horse-drawn army wagons. This plan has been abandoned. The transfer caused a loss of time and the final distribution by horses was far less reliable than a direct delivery by motor. Thus, whenever possible, the horse has been cut out of this service altogether. It is practically immaterial whether the railhead be 10, 20 or 30 miles behind the firing line, for the trucks can be relied to come right up with unfailing regularity.

Trucks Under Fire

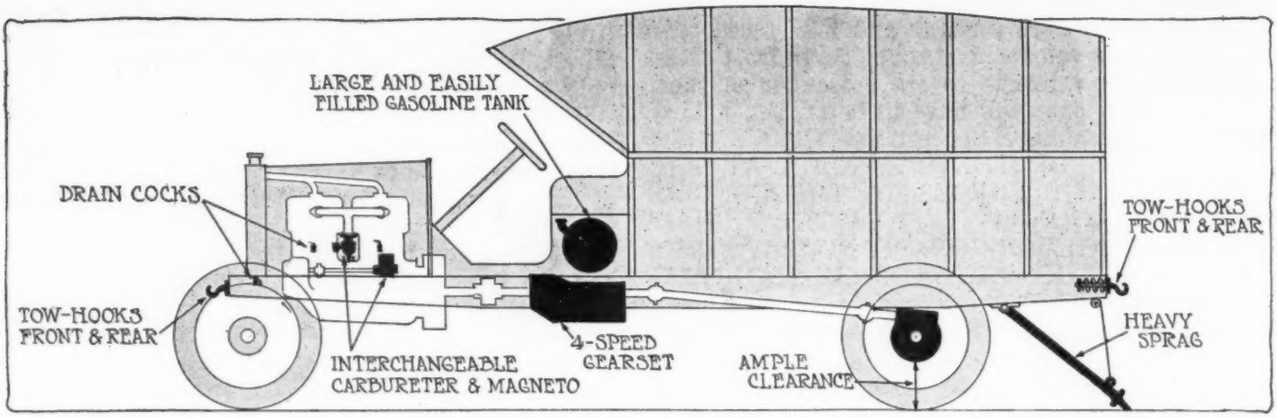
A motor convoy under fire is in less danger than a number of horse-drawn wagons. A great proportion of the horses used in the army service corps are taken direct from peaceful occupations, and are naturally scared at the tremendous roar of modern guns. It is impossible, without entering into ghastly details, to describe the confusion caused in a column by a few horses struck by bullet or shell. Although the motor truck has not been made bullet-proof, it is surprising how difficult it is to put it out of business. I have seen trucks speckled all over with shrapnel without having their running qualities in the least affected. Compared with a horse, the modern motor is a very small target, and unless a bullet strikes the cylinders or goes through the radiator the vehicle is not likely to be incapacitated.

The Ideal Vehicle

THE MOST SUITABLE TYPE IS A VEHICLE CARRYING A USEFUL LOAD OF 2½ TO 3 TONS, DRIVEN BY A FOUR-CYLINDER MOTOR OF 3¾ TO 4-INCH BORE. THE IMPORTANCE



Left—D'Avaray, a competition driver for Buick, doing service for the French Army on a Pierron car. Right—Arthur Duray, winner of second place in last Indianapolis race, now in military service with the French army



Illustrating the requirements brought out as necessary in the construction of motor trucks for military service by the experience gained during the fighting in France

OF CERTAIN FEATURES HAS BEEN FULLY EMPHASIZED DURING EVEN THE SHORT PERIOD THE WAR HAS BEEN IN PROGRESS. THESE ARE ADEQUATE CLEARANCE, STOUT SPRAGS AS A PRECAUTION AGAINST RUNNING BACKWARDS, TOWING HOOKS FRONT AND REAR, THE ABILITY OF EACH TRUCK TO TOW ANOTHER OF EQUAL WEIGHT OVER ORDINARY ROADS, FOUR-SPEED GEARBOXES WITH A LOW EMERGENCY GEAR, INTERCHANGEABLE CARBURETERS AND MAGNETOS, EASILY FILLING AND EMPTYING GASOLINE TANKS, DRAIN COCKS FOR CYLINDERS AND RADIATORS.

Trucks Must Tow

This question of towing ability is really important. It is an everyday occurrence for a truck to be temporarily disabled. If it can be got back to headquarters a few hours' work will put it in full running condition. If, on the other hand, a tow is not immediately available the vehicle may have to be destroyed or fall into the hands of the enemy.

Big capacity gasoline tanks are an important feature. There has never been any permanent shortage of gasoline among the allied troops, but it frequently happens that unusually long journeys have to be made without any possibility of renewing the fuel supply. The more gasoline a truck can carry without in any way interfering with the useful load, the better.

Provision should also be made for a reserve supply. A tank which can be quickly emptied is a valuable feature. I have had several experiences as follows. English drivers have asked on the wayside for petrol, which is the French word for kerosene. They have been given exactly what they asked for, with the result that a few hours later they found themselves stranded with fouled plugs and a spluttering motor. To get the kerosene out of the tank not fitted with a special drain-off cock is a longer job than one would imagine.

Bad Water Connections

Up to the present really severe weather has not been encountered. Nevertheless it has been sufficiently cold to remind us that frost will have to be feared and radiators and waterjackets emptied. Looking into this matter, I have been struck with the fact that it is sometimes absolutely impossible to get the water out without breaking one of the rubber connections. In the shops it would not be a difficult matter to fit drain cocks in the base of the radiator; but there is little time and few conveniences for carrying out such work at the front.

Two Hours to Start

Already the cold weather is making it a difficult matter to start up in the morning. Before all the motors in one convoy to which I was attached had been wound up 2 hours had been lost. This incident occurred after a very cold damp night spent out of doors. When benzol and alcohol have to be used the difficulties are so much greater that permanent provision should be made for warming up the carbureter before attempting to crank.

There has been no necessity in this war to work entirely away from made roads. Thus there is no necessity for anything more than a liberal clearance.

Four-Wheel-Drive Tractors

It is quite probable that after this war there will be an entire reformation of the artillery service, four-wheel-drive tractors being used in place of horses. At the present time horses do the bulk of the work of hauling guns. The French, however, are using tractors for their 155-millimeter guns and obtaining such good service from them that they are certain to be extended. The advantages of mechanical over animal traction in the commissariat department are amplified in the artillery service. The future points to guns without horses, for a four-wheel drive tractor can do all, if not more, than a team of horses; it is not so vulnerable and it can be more rapidly replaced.

All-drive tractors are also a valuable auxiliary for bringing up ammunition. At the present time the great bulk of the ammunition is brought up on motor trucks, but as it is always necessary to do some cross-country work to travel direct to the batteries, a four-wheel-driver has a decided advantage over a vehicle alive at only one end.

This war had not been in progress many days before it was evident that the allies were short of

automobile guns. The Germans, who were supposed to possess a smaller number of automobiles than the French and English, had not overlooked the importance of mounting their medium-sized guns on automobile chassis. Caliber for caliber, a gun mounted on a chassis is infinitely superior to one drawn by horses. An automobile battery will remain in position until the last possible moment. When it is about to be attacked at close quarters it will get away beyond the possibility of pursuit.

THE VALUE OF THIS ARM HAS BEEN SO CONCLUSIVELY DEMONSTRATED THAT BOTH THE ENGLISH AND FRENCH HAVE PLACED BIG ORDERS FOR AUTOMOBILE GUNS SINCE THE WAR BROKE OUT.

In very many cases ordinary 2½-ton chassis are being made use of, the fitting of the gun being carried out by the arsenal. While this makes a valuable weapon, better results are obtained with a specially designed chassis having provision against the recoil of the gun and a certain amount of armor plating.

Much use has been made of armored automobiles for rapid invasions into the enemy's country. Two or three such machines sent out to explore the country are practically invulnerable and most effectively prepare the way for the advance of more important bodies.

Eight-Cylinder Motors Best

I am not particularly interested in the aeroplane as a weapon of offence and defence. Even military experts are not unanimous regarding the services it has rendered. The aeroplane motor question, however, has its bearing on the automobile.

THERE IS A GROWING OPINION AMONG AVIATORS AND AEROPLANE MECHANICS THAT THE FIXED TYPE OF MOTOR IS PROVING MUCH MORE VALUABLE THAN THE VARIOUS ROTATING CYLINDER MOTORS. THE GREAT OBJECTION BROUGHT AGAINST THE ROTARY MOTOR IS THAT IT REQUIRES MUCH MORE ATTENTION THAN CAN BE GIVEN IT UNDER WAR CONDITIONS.

Trials and manoeuvres are so entirely different from actual warfare that it has required the events of the last 2 months to reveal the weaknesses of the rotary motor. The two leading types of eight-cylinder V motors, made by De Dion Bouton and Renault, have been conspicuous for the service they have rendered and the small amount of attention they have required. This is important at the present time, for the De Dion Bouton eight-cylinder aviation motor is practically identical with the eight-cylinder car motor produced by that firm.

Gasoline Tanks Too Small

Touring cars have given all that was expected of them and considerably more than most people hoped. The main faults I have noted against touring cars on military service is the inadequacy of the accommodation for spares, tires, gasoline and spare gasoline supply. For this work cars should have a capacity of 200 miles without refilling the gasoline tank.

WITHOUT LITTERING THE BODY IN ANY WAY, IT SHOULD BE POSSIBLE TO CARRY 2 GALLONS RESERVE GASOLINE, 1 GALLON RESERVE OIL, TWO SPARE SHOES, FIVE OR SIX TUBES, A BIGGER SUPPLY OF TOOLS THAN USUAL AND A MODERATE SELECTION OF SPARE PARTS.

It is surprising how few cars can stow these things away without infringing on the passenger-carrying space. Very few actual defects can be charged against the cars in the field. Certain makes of cars built for good road conditions have suffered from spring trouble, but this is not a general complaint.

Small Cars Best

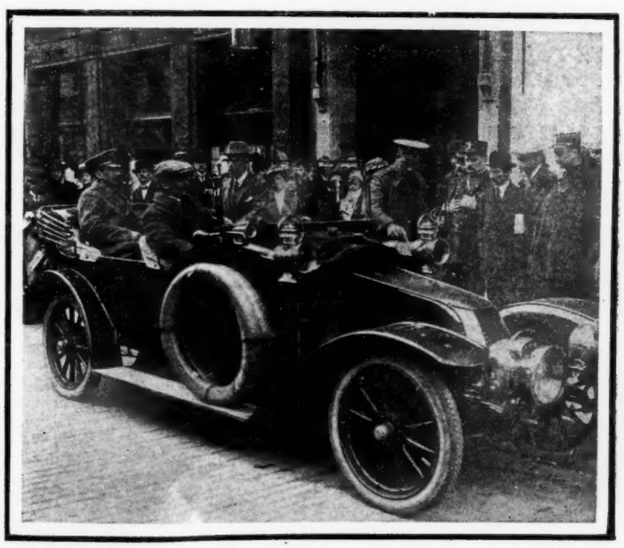
While the cars themselves have generally been satisfactory, their method of employment has often left much to be desired. The fast, powerful touring car is not the most suitable vehicle for work near the firing line. Crack motorists who have been given 70 and 90-horsepower cars have soon discovered that they could get better service out of 15-horsepower machines than out of the semi-racing models.

At the front the roads are encumbered; all the power available cannot be used; a heavy car embedded in mud or dropped into a ditch is much more difficult to move than a lighter machine.

For work right at the front much better results are being got out of four-cylinder touring cars of approximately 3 by 5 inches bore and stroke than out of machines of double that size.

Fast Cars for Dispatches

The proper place for very powerful extra rapid cars is on the open road, carrying officers or dispatches from the front to the base or the government headquarters. For instance, at the present time the French government is at Bordeaux, 400 miles from the firing line. All the dispatches are carried between the two centers by two relays of cars, the first driver covering 200 miles, then handing his dispatches over to a second driver waiting at the halfway position. With 70 and 90-horsepower cars this



Earl Fitzwilliam, head of the mechanical transport service of the British army, leaving Paris for the front

work can be done faster than by trains under peace conditions.

Many Poor Drivers

The suitability of the driver for the car he is handling is another important matter. When cars have been requisitioned from factories, not enough attention has been paid to the question of getting drivers from the same factory. It is obviously advisable for a man who has spent 10 years of his life tuning up Panhard cars to be put at the wheel of a machine of this make rather than a Peugeot, a Renault, or any other. In the main this has been done, but there are nevertheless some glaring inconsistencies.

Gabriel, who has probably driven cars longer than any man living, has been pushed into a line regiment.

Louis Wagner, one of the most skilled and daring drivers alive, as well as an experienced aviator, is a private in an artillery regiment.

The famous Jules Goux was wasting his talents in a fort for a couple of months before he was given a car.

Jean Chassagne, the man who has driven further in 1 hour than any person dead or alive, has not been allowed to touch a car since war was declared.

On the other hand, could be mentioned chief engineers and heads of testing departments who are riding on trucks as private soldiers while some non-technical man is at the steering wheel. This is a phase of motor application to war which must be given the closest attention if best results are to be obtained.

Good English Ambulances

Little criticism can be levied at the quality of the motor ambulance work of the British army, although its quality might be improved. The method is for motor ambulances to go as close to the firing line as possible, load up with the wounded brought in by the stretcher men and carry them to the railhead or general headquarters, where they are tended in temporary hospitals, which are frequently nothing better than churches, barns or railroad stations. From this point the wounded are carried to the rear by trains and finally distributed among the hospitals by more motor ambulances.

The type of ambulance most generally used at the front is a 20-horsepower touring-car chassis fitted with a large capacity canvas body with mica windows. The body is of sufficient size to carry four stretchers in two tiers, leaving a space down the center for the ambulance attendant.

Most of these vehicles have been supplied by the Wolseley company, and are the pick of the British fleet. There are other and more hastily prepared ambulances carrying six men in two vertical rows of three. With such a load it is practically impossible to give any attention to the men when on the move, while loading and unloading present greater difficulties.

The French system of slinging stretchers inside the closed trucks which are returning from the firing line to the rear has the advantage of getting the men away quickly, but it offers little in the way of comfort.

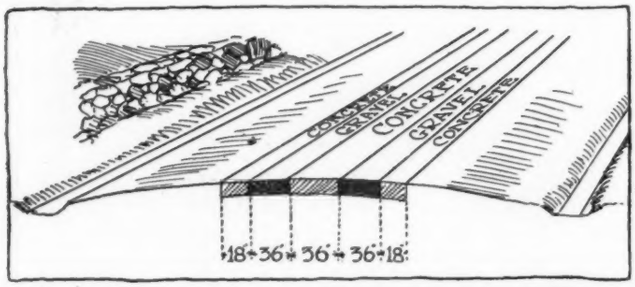
One Failure

The great defect in the general organization is the inadequacy of the motor system for removing men from the hospitals just to the rear of the firing line. Frequently wounded men have to spend 15 to 20 hours lying on straw in a freight train, when touring cars could bring them back in 3 to 4 hours. The army does not possess these cars, but hundreds of private individuals and several private associations would be glad to undertake the work, and indeed have undertaken it to a limited extent. Why this work is not carried on on a bigger scale and in a more effective manner it is difficult to say. There is no doubt that the car is infinitely superior to the railroad for this task.

Michigan County Makes Highway Like Railroad

THE influence of railroad practice is noted in an experimental road being tested in Kent county, Mich. The wear and tear of traffic is taken by strips of concrete, the space between the strips being separated by gravel. Three strips are used, the center one being twice as wide as the other two and intended to be used in common by traffic in both directions.

As will be noted in the accompanying illustrations, the two outer strips are 18 inches in width while the center one is 36. The bands of gravel between the concrete are 36 inches in width. The total breadth of the roadway is 9 feet 4 inches. The two intermediate widths are composed of gravel cemented into place with glutrin.



Method of constructing road in Kent County, Mich., designed especially to prevent ruts. It costs $3,000 per mile

The inventor of this new construction is Alvah Brown, one of the commissioners of Kent county. He explains that the natural inclination of horses is to follow the rut and it is therefore necessary to design a road which will withstand heavy wear without forming ruts and which will not at the same time involve heavy construction cost.

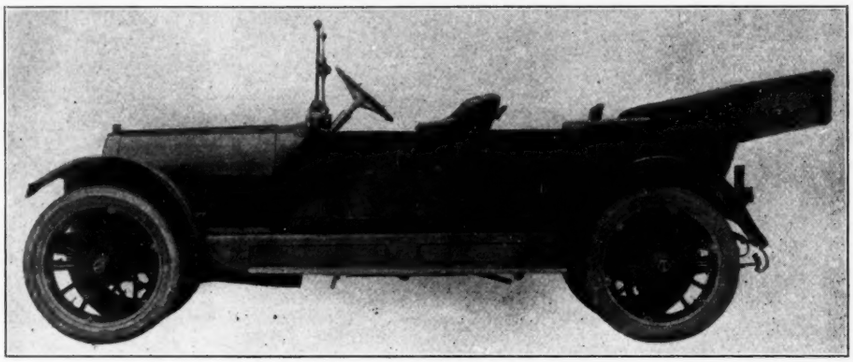
In commenting upon his method, Mr. Brown says:

"It is no more necessary to have the entire portion of the roadway cemented than it is to have iron spread the full length of the ties on a railroad. All that is necessary is narrow hard surfaces for the wheel treads and these, being built according to my design, will be dustless and meet all requirements for modern traffic. Every 30 feet each strip of concrete will have an expansion joint with metal strips therein, so the concrete ends at joints will not be broken by steel tire vehicles.

"After the roadbed has been graded and settled, this class of road can be built complete, including concrete and glutrinized gravel, for about $3,000 per mile.

Seven-Passenger Overland Six $1,475

New Block Motor 3 1-2 by 5 1-4 —Electric Starting and Lighting— Equipment Is Unusually Complete



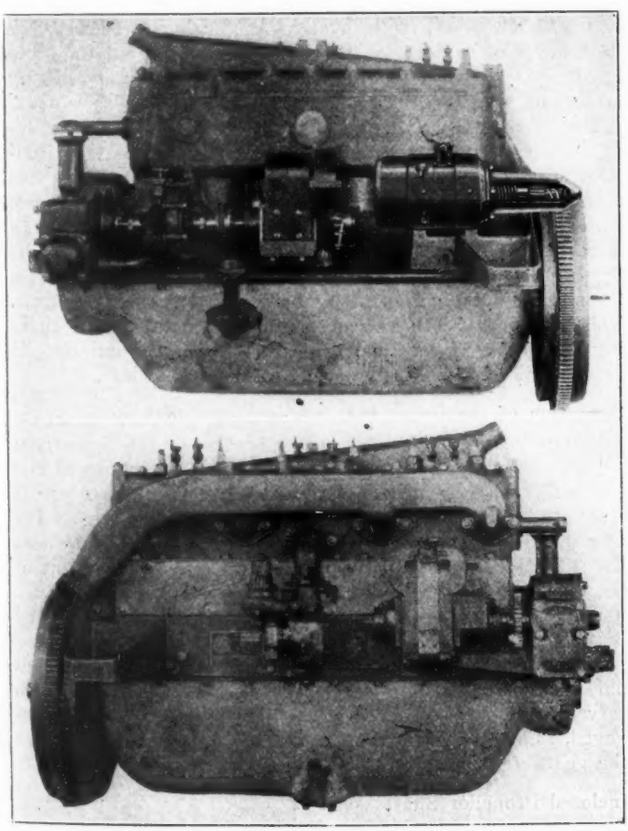
Six-cylinder, seven-passenger Overland touring car which sells for $1,475 with electric starting and lighting and complete equipment

ALTHOUGH the Willys-Overland Co. told the public in June that it would have a six-cylinder car bearing the Overland name on the market early in the fall, it did not make known any of the details at that time. Now the fall is at hand and so is the new Overland, the first six that the big factory has ever turned out.

Seven-Passenger Body Standard

Only the one body type is offered, a seven-passenger design which has the same general outward appearance as the four-cylinder Overlands, being a smooth-sided model with clear running boards, domed fenders conforming closely to the curve of the wheels, and cowl sloping in graceful curves to the bonnet, which also has a slight slope to the radiator. Like the rest of the Overlands of the year, the radiator is specially attractive, being of the rounded-edge type with the shell pressed from one piece of sheet steel.

The price has been set at $1,475 with complete fittings ready for the road. There is an electric cranking and lighting system, besides an unusually complete list of equipment including speedometer; rain-vision, ventilating windshield; mohair one-man top and top boot; electric horn; demountable rims with one extra; tire carriers in the rear; robe rail; foot rest; tools, tire repair kit; jack and pump. Tires are 35 by 4 1-2 inches and the rear pair are of the non-skid variety.



Views of both sides of the block motor used in the new Overland six. The valves are all on the right, inclosed by aluminum cover plates which are easily removable. Note mounting of electric starting and lighting system

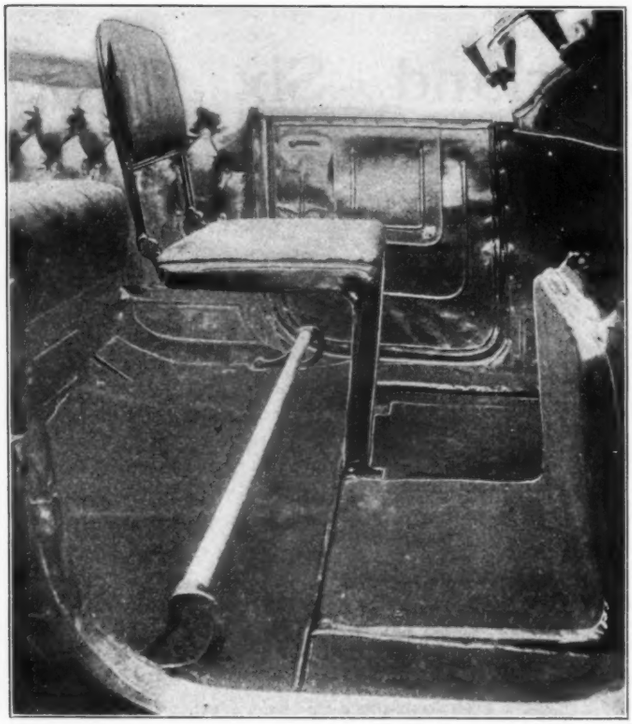
New Long-Stroke Block Motor

While the general mechanical construction of the chassis is in accord with Overland design as practiced in the four-cylinder models, the motor of the six is new to Overland engineering. It is a block-cast type having a bore of 3 1-2 inches and a stroke of 5 1-4 inches. The cylinder head is detachable as a unit and the upper half of the crankcase carrying the crankshaft is a part of the cylinder casting. The lower half attaches at about the center line of the bearings and thus an advantageous adaptation of the detachable cylinder head design together with the better manufacturing proposition brought about by making part of the crankcase integral with the cylinder casting, is worked out.

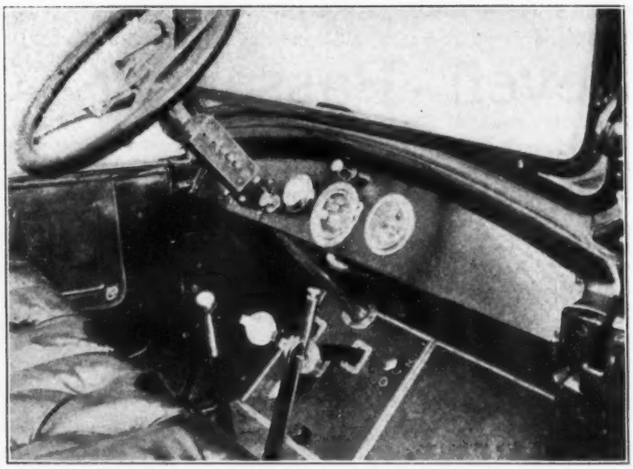
The stroke is quite long in comparison with the bore, the ratio being 1.5 to 1, and with this relation the developed horsepower is greatly in excess of the S. A. E. formula rating of 29.5 horsepower. According to the maker, the engine produces 45 to 50 horsepower in test in very excellent fashion and with a striking absence of vibration. The piston displacement figures to approximately 303 cubic inches.

Rear Axle Gearbox

Although the gearbox is not in unit with the motor, it being a part of the rear assembly as in all Overland cars, the motor is of the three-point suspended type with substantial arms integral with the cylinder block casting running outward to the chassis supports just forward of the flywheel. The front end rests upon a cross arm by means of a form of foot also integral with the cylinder casting. Two bolts, one either side of the bearing in the supporting member for the crank-handle shaft, fasten the motor in place in front; this mounting really serving as a single-point construction. The arrangement may be seen in the motor view.



Illustrating the manner in which the auxiliary seats in the tonneau of the seven-passenger Overland six fold into the back of the front seat



Driver's compartment of the new Overland six, showing left drive and center control, together with mounting of instruments on cowl board

The valves are all on the right side, and are neatly housed by two aluminum plates held in place by five set screws each. There are four openings from the exhaust ports to the exhaust header, two for each set of three cylinders. But there is only one opening from the casting to the intake pipe running from the carbureter. This is at the center of the casting just below the exhaust pipe, the distribution to the several intake pockets being accomplished by cored passages within the casting itself. This serves to aid vaporization of fuel because the gases are heated by the jacket water around the cored passages.

The cylinder head, which is held in place by a number of steel bolts, carries the water outlet connection to the radiator as an integral part, holds the spark plugs and priming cups. This head when removed exposes cylinders, pistons, valves and valve chambers.

Spiral Gearing Much Used

The drive for the camshaft, magneto, pump and generator is unusual in that spiral gearing plays an important part. A transverse shaft, spirally driven from the crankshaft in turn drives the magneto and pump shaft on the left side by spiral connection and the generator on the right side by the same type of gearing. The camshaft is also spirally actuated from the same shafting, all of which is completely housed at the front of the motor. This makes a very compact and well-balanced design which should be very silent in operation.

Accurate Balance and Light Weight

Accurate balance of reciprocating parts is also a feature of the motor, and vibration is reduced to the minimum not only by this means but also by reducing the weight of the reciprocating parts as much as possible so as to be consistent with the strength required. The crankshaft which is substantially mounted on three main bearings is manufactured to very close limits, while the camshaft, carried on four bearings, is also very strong.

The lubrication of the motor is of the constant level splash type in connection with pressure feed to the main crankshaft bearings. The oil base is in the bottom of the crankcase, and the pressure pump forces the oil from it to the main bearings and also the connecting-rod troughs, individually placed under each cylinder and the oil from them being thrown to the various bearing surfaces from the ends of the rods. The lubricant drains back to the crankcase reservoir for recirculation after straining.

Cellular Radiator

Cooling is very efficient and employs a centrifugal pump mounted ahead of the magneto and operating from the same shaft. Its cooling work is augmented by a good-sized fan which is belt driven from a pulley on the pump shaft. The radiator is of the cellular type with vertical circulation, and is carried on swivel trunnions which allow for the twisting strains of rough travel.

The electric lighting and cranking system is entirely independent of the Bosch high-tension magneto used for ignition. Cranking motor and generator are separate units and occupy positions on opposite sides of the engine. The electric motor connects to the engine for cranking purposes through a gear meshing with the teeth cut in the outer rim of the flywheel, a pedal when pressed sending current to it from the storage battery and meshing the gears at the same time. This cranking unit is very powerful and is capable of turning the engine over at about 140 revolutions per minute. It revolves at 11.33 times the speed of the crankshaft.

Operation of the Generator

The generator which rests upon a bracket on the right front side of the engine is driven at 1 1-2 times engine speed and efficiently charges the 80 ampere-hour storage battery. It starts to send current to the latter when the car is traveling at about 8 miles an hour and reaches its maximum output at about 25 miles an hour car speed. The electrical system is of the 6-volt, single wire type, which is the simplest possible.

Leaving the motor, the next step in the power transmission is the cone clutch which is leather faced with spring-pressed studs under the clutch facing, these insuring easy and gradual engagement. A clutch brake is also provided which serves to stop the released cone from spinning when disengaged, this being an advantage for easy gear shifting, since the gears are not spinning to clash when meshed.

Inclosed Propeller Shaft

Regular Overland practice is seen throughout the balance of the chassis in the inclosed propeller shaft with universal joint at the front end, and the torsion tube surrounding it having a yoked front end hinging to a cross member of the

frame at either yoke arm end. The torsion tube terminates in a flange which bolts to a mating flange on the front end of the compact gearbox. This latter bolts through another flange to the differential housing so that axle, drive members and gearset are all one unit. Strong radius rods run from the front end of the tube to the outer ends of the axle tubes as a strengthening feature.

Three-Speed Gearbox

The gearset is of the selective, sliding-gear type giving three speeds forward and reverse. The gears are of ample proportions, made of double heat-treated nickel steel and having strong stub teeth. The shafts are carried on annular ball bearings. This gearset is a special design for the six chassis, though conforming to the same general construction as that used for the other cars, only having larger bearings, and so on.

The rear axle is a floating design in which the car load is carried on the axle tubes and the shafts within are used for the sole function of driving the wheels. These shafts are removable, connecting to the differential conventionally by means of splines. The differential consists of the usual four bevel gears within the ring gear. Adjustable taper roller bearings are used throughout, there being two in each wheel and two for carrying the differential. The axle ratio is 4 to 1, which should give the car plenty of pulling power.

The brakes are large and powerful and said to be ample for a much heavier car. However, such factors of safety are commendable for no part of the car is of more importance than the brakes. The contracting service brakes measure 14 3-8 inches in diameter by 2 1-4 inches wide, while the expanding emergency pair are 14 by 2 1-4 inches.

Rear Springs Are Underslung

The spring suspension is well taken care of by the conventional half-elliptic front springs and three-quarter elliptics in the rear. Leaves are 2 inches wide, while the front length is 38 inches, and the rear 52 inches. To bring the suspension lower down and add to easy riding qualities, the rear springs are slung under the axle and have swivel seats. The maximum freedom of motion is thereby attained. These springs are attached outside of the frame rails by means of gusset plate construction and their rear ends are of the scroll form.

Left Drive and Center Control

Control of the car is standard in every respect, excepting that all control buttons for horn, magneto, starter and lights are conveniently located in a switch box attached to the steering column, just below the wheel. Drive is on the left by means of an 18-inch steering wheel operating a worm and full gear type of steering mechanism, while center control is also featured. The spark and throttle levers occupy the usual position on the steering wheel quadrant above the spider, while the various gauges and dash instruments are conveniently arranged on the cowl dash, those requiring to be reached when in driving position being nearest the drive seat.

The wheelbase of the newest Overland is 125 inches, 19 inches longer than that of the model 81 small four, and 11 inches greater than the larger four, model 80. Tread is standard at 56 inches.

Vacuum Feed Fuel System

Although the gasoline tank is placed under the front seat, making gravity feed to the carbureter very reliable, the new Overland makes assurance doubly sure by the use of the Stewart vacuum feed system with the vacuum tank mounted on the front of the dash. This makes the carbureter supply positive under all driving conditions such as steep hill work and the like. It raises the level of the fuel going to the carbureter about 6 inches above the main tank level.

The principal motor specifications follow:

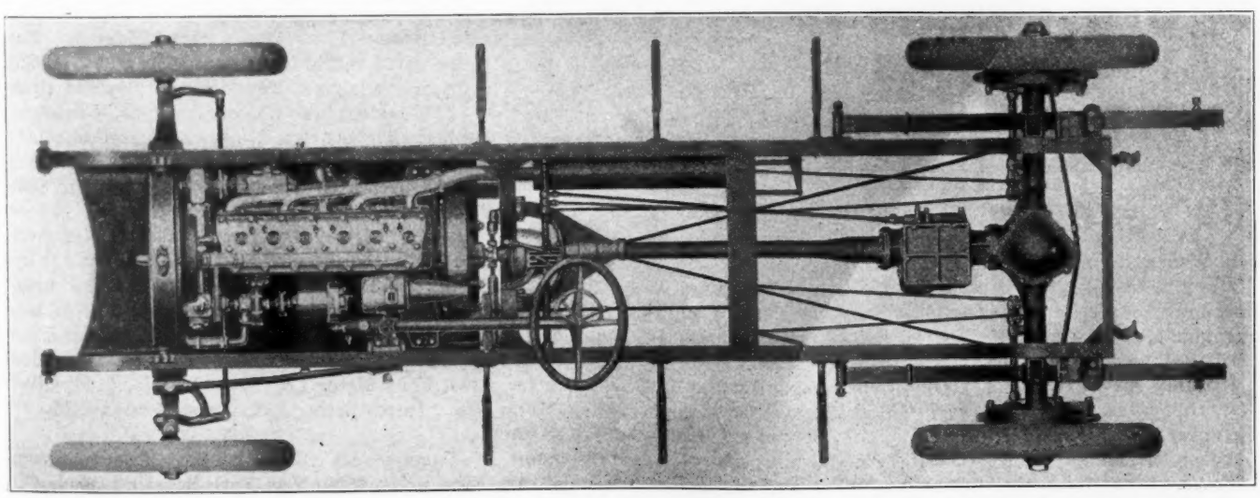
Camshaft diameter	1 1-4 inches
Camshaft bearing, front	2 1-4 by 2 3-4 inches
Camshaft bearing, No. 2	1 by 2 3-16 inches
Camshaft bearing, No. 3	1 by 2 1-8 inches
Camshaft bearing, rear	1 1-2 by 2 1-16 inches
Connecting-rod, length	9 3-8 inches
Connecting-rod bearings	2 by 2 3-16 inches
Crankshaft, diameter	2 inches
Crankshaft bearing, front	2 3-16 by 3 inches
Crankshaft bearing, center	2 7-32 by 2 1-2 inches
Crankshaft bearing, rear	2 1-4 by 3 inches
Piston, length	3 3-4 inches
Piston pin bearings	1 1-16 by 1 1-2 inches
Piston rings, three, width	3-16 inch
Valve, diameter	1 13-16 inches
Valve stem, diameter	3-8 inch

Form American Drop Forge Association

DETROIT, MICH., Nov. 2—About twenty representatives of some of the largest drop forge manufacturing concerns in Michigan, Ohio, Indiana, Virginia and Canada, met at the Ponchartrain recently and took the preliminary steps towards the organization of what has been temporarily named the American Drop Forge Assn.

The object of the new body is to get together for the purpose of business, pleasure and good fellowship.

The following temporary officers were elected: R. R. Ellis, superintendent Detroit Forging Co., president; George Desautels, manufacturing manager, Anderson Forge & Machine Co., vice-president; A. E. Dibble, department manager, Frost Gear & Machine Co., Jackson, Mich., secretary; E. B. Horne, forge and foundry superintendent, Packard Motor Car Co., treasurer.

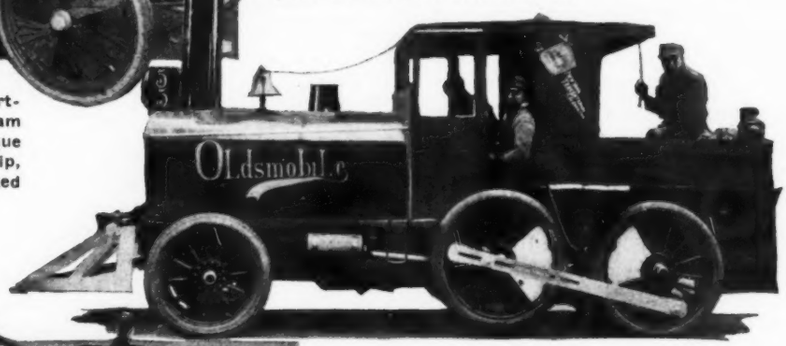


Chassis used in the new Overland seven-passenger six, showing mounting of block motor, electric units and rear axle gearbox

New York's Tercentenary Pageant

Veteran Cars and Novel Decorations Win Many Prizes

Above—Peace float of C. B. McCoy, Jr., Philadelphia, Pa., which was awarded the $500 first prize for the best decorated car



Above—Autumn decorated Waverley, Poertner Motor Car Co. Right—Oldsmobile steam engine, $200 first prize winner in Grotesque division. Below—Oldsmobile Christmas ship, which took $200 prize as second best decorated car

NEW YORK CITY, Oct. 30—The Automobile Pageant of New York City's Tercentenary Celebration, which was held Wednesday night, was a great success.

Many unusually well decorated cars and trucks were in line and great originality was shown by the dealers, clubs and individuals participating. The list of prize winners as officially issued, is as follows:

DIVISION A—Early Models—Oldest car completing the line of march under its own power. First Prize, $100, Joseph Devantry, Brooklyn, N. Y., 1899 Panhard. Second prize, $50, Oldsmobile Company of New York, 1898 Oldsmobile.

For best appearing car operating under its own power built during the period of January 1, 1902 to December 31, 1905. Third prize, $25, Harrolds Motor Co., 1902 Pierce-Arrow.

DIVISION B—Grotesque. First prize, $200, Oldsmobile, Steam Engine. Second prize, $100, Fleischmann Company, John Dough. Third Prize, $75, Michelin Tire Company, Bibendum Twins. Fourth prize, Douglas Fairbanks, He Comes Up Smiling, Bathtub Float.

DIVISION C—Pleasure Car—Class 1. Best decorated car. First prize, $500, C. B. McCoy, Jr., Philadelphia, Peace Float. Second prize, $200, Oldsmobile Co. of America, Christmas Ship. Third prize, $100, Allen Auto Specialty Co., Autumn Float. Pleasure Car—Class 2. Best decorated runabout. First prize, $250, John W. Cleary, Brooklyn, N. Y., Oriental Pagoda. Second prize, $100, Poertner Motor Car Co. Class 3—Regularly established club with the highest rating of points. First prize, $200, Long Island Automobile Club. Second prize, $100, Automobile Club of America. Third prize, $75, Bug Club of Harlem. Class 4—Dealer having the greatest number of cars of one make represented by him in a division. First prize, $200, Ford Motor Co. Second prize, $100, Chevrolet Motor Co. Third prize, $75, Brady-Murray Motors Corp., Chandler.

DIVISION D—Commercials. Class 1—Best decorated commercial car. First prize, $500, New York Sporting Goods Co., Indian Motorcycle Float. Second prize, $200, Edward Callen

Third prize, $100, Max Schling. Class 2—Merchant entering the largest fleet of commercial trucks as owned and operated by him. First prize, $200, Loose-Wiles Biscuit Co. Second prize, $100, New York Edison Co. Third prize, $50, Ward Bread Co. Class 3—Dealer having the greatest number of commercials in one division. First prize, $200, Autocar Co.

DIVISION F—Advertising. Best appearing vehicle carrying advertising other than merely name and address of owner regularly used in service. First prize, trophy valued at $150, Omar Cigarettes. Second prize, $100, Bull Durham Tobacco. Third prize, $75, Atlas Cement Co.

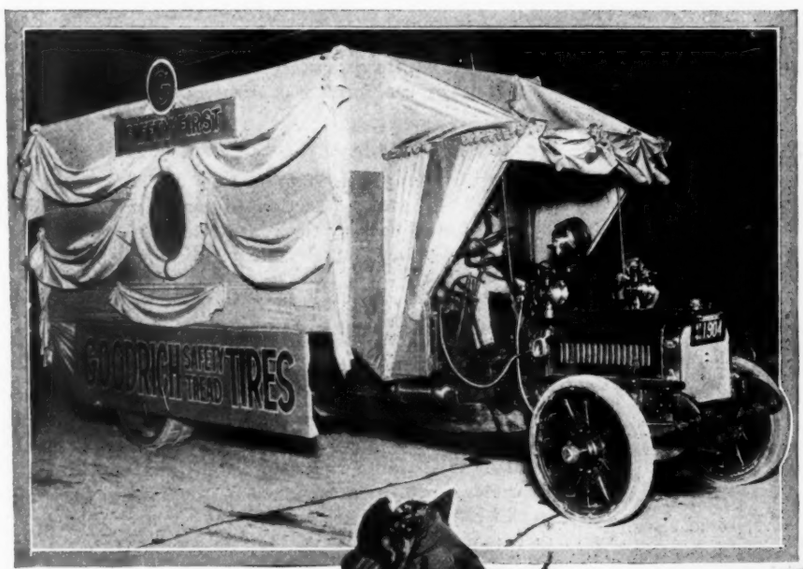
Special prizes donated by various individuals were allotted as follows: Silver Cup by J. Sanford Saltus, for the best French car, awarded to Emanuel Lascaris, DeDion-Bouton car. Other special prizes for the automobile division were the Hub Odometer, Brown Oil Boxes, Automobile Club of America. The odometer given by the Veeder Mfg. Co. was awarded to Doelger Brewery Co. for the largest fleet. The Brown oil box donated by the Brown Trafilog Co. to the Vivandière car. The Automobile Club for long distance mileage. Special mention, the Grotesque Class, Tipperary Float and Baby Olds. Dealers' Window Display prize, $100, Firestone Tire Co.

—

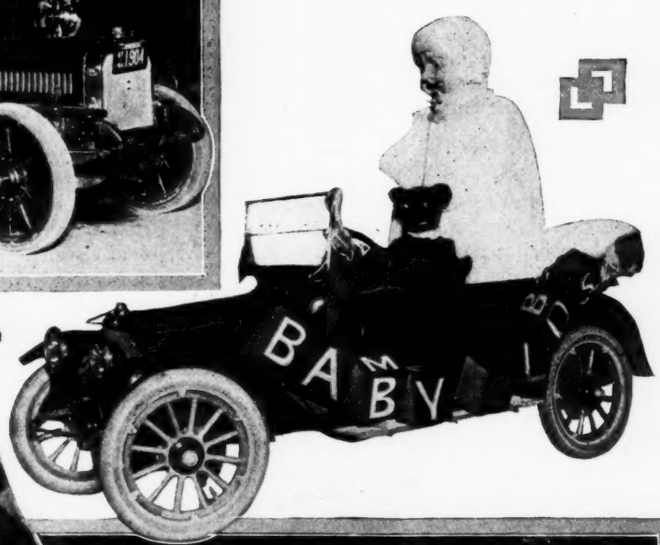
Fischer Car to Be Built in York

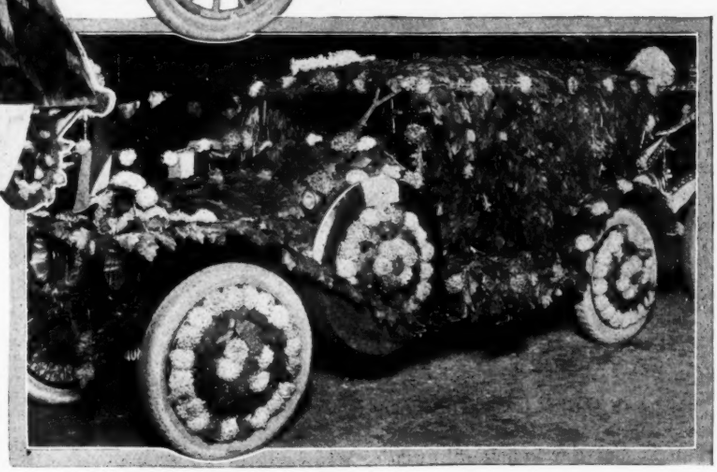
YORK, PA., Nov. 3—Announcement of a new automobile to be manufactured in York was made recently by C. J. Fischer, of Detroit, Mich. Yorkers have provided $50,000 capital to launch the concern. Operations will be started in the plant of the Glen Rock Stamping Co., located at Hill street and the Maryland & Pennsylvania railroad. The car will be an assembled one and the first will be turned out in 2 weeks, it is said. Sample cars are now in the city.

The corporation, which will be known as the Fischer Motor Vehicle Co., will, it is stated by Mr. Fischer, build five models on one standard chassis. There will be a two-passenger speedster at $595, a two-passenger cabriolet at $645, a two-passenger tourist at $595, a four-passenger Sedan at $845 and a four-passenger tourist at $645. The designs are by Mr. Fischer himself.



Left—Float of the B. F. Goodrich Co. in the Tercentenary pageant. Below—Baby Oldsmobile, which was awarded special mention in the Grotesque division





Above—One of the Chandlers. Brady-Murray Motors Corp., Chandler dealers, were awarded third prize of $75 for having most cars in a division. Right—Autumn float of Allen Auto Specialty Co., which took $100 third prize for best decorated car

Thinks Driving Through Springs Impairs Their Efficiency

The Automobile Engineers' Forum

Endurance of Springs Is a Function of the Stresses Imposed on Them—Effect on the Rear Axle Design

DETROIT, MICH.—Editor THE AUTOMOBILE:—Your notes on this question in THE AUTOMOBILE for July 23 and July 30 have been of interest, and a few additional points might profitably be added.

Referring first of all to the question to taking the driving, torque and braking stresses through the springs. This certainly reduces the production costs by reason of the elimination of torsion tubes and radius rods. The question as to which is the better method is worth discussion, however.

Might Impair Spring Action

General opinion would seem to suggest that the method of transmitting these additional forces through the springs is likely to impair their abilities to perform their functions as vibration dampers.

Primarily the springs need to have a predetermined flexibility, to give easy riding.

The endurance of the springs is a function of the stresses imposed upon them and, assuming equal physical properties of the spring steel, will the imposition of these additional stresses materially decrease their life?

An Explanation Needed

In view of the extremely satisfactory results attained from their use in this direction in instances of extreme severity, to instance the London omnibuses so equipped, and the fact of their being used on nearly all racing cars, some explanation should be forthcoming.

To consider the action of the forces imposed by the drive and torque.

The tendency of the springs when subjected to these loads is to assume a shape as shown in Fig. 1 where it will be seen that a point of inflection occurs at a point h in this extreme position.

Now let p = drawing effect concentrated at the anchored end, that is assuming the front end of the spring is fixed, thereby placing the spring under compression, and T the driving torque which is equal and opposite in magnitude and direction the axle torque. W = vertical load on the spring. The effect of the torque will be to increase this weight W by the amount I ÷ L.

The spring will normally have a certain camber H; the thrust P will therefore have a movement about the spring center equal to PH.

The effect of this movement PH will be to oppose the effect of the torque to create a point of inflection h which is the critical point and a condition which must be avoided.

This extreme condition is likely to take effect if when a violent bump occurs, the spring assumes a negative camber, as it will be observed that the moment PH due to driving thrust would increase the tendency to contrary flexure.

Reasonable Camber Desirable

Therefore the spring should have a reasonable camber under load.

This is contrary to general practice because it is well known that a flat spring under load will ride much better than one of excessive camber. This follows by reason that with a flat spring the momentary increase in load will act perpendicularly to the spring eliminating any horizontal component which would be delivered in the form of an impact from wheel to chassis.

Again, since the spring acts as a strut under the action of the driving effort, its resistance would obviously be greater if the direction of the force was directly along the neutral axis of the section.

Thin Leaves for Flexibility

It is generally supposed that the top leaf of the spring should be made of greater section to resist this additional force, but this would destroy the feature of thin leaves which are alone conducive to good flexibility, minimum stress, and hence long life.

In what manner will transmitting the drive and torque through the springs affect the design of the axle?

Effect on Axle Design

In the first place, the springs need to be rigidly connected to the axle case. The case will need to be made substantially stronger to transmit the torque, as on account of the length or distance of the twisting couple, that is from the center of the drive to the attachment of the spring, the angle through which the axle case would twist would be proportional to L and is a measure of the resulting stress.

Prefers Full Floating Axle

Therefore it would seem that a full floating axle would be preferable as the axle case would be sufficiently strong, while even were the semi-floating type to be considered for divergent reasons, its axle case would have to be materially strengthened, bringing its total weight approaching that of the full floating type while it would not possess the advantages of the former.

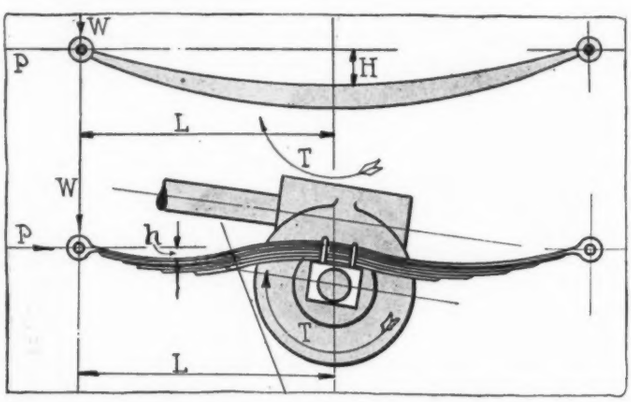


Fig. 1—Upper—Spring under normal conditions. Lower—Shape which the spring tends to assume when subjected to torque and driving effort

Again, a point worth noticing in the rigidly connected axle and casing, is the stresses induced in the axle casing by the oscillation of the wheels.

Assume one wheel to rise relative to the other. Normally the distance between the spring centers is L, Fig. 2.

When one wheel rises it should follow the arc of radius R with the center of the corresponding wheel as pivot, but since the point A is constrained to move in a vertical direction by the spring the axle must lengthen by an amount X equal to the difference between the length of L_1 and L.

A Fracture of the Axle

If, as is usual, the springs are stronger in their resistance to transverse twisting, fracture of the axle will eventually occur.

The alternative is the excessive binding action on the shackle pins causing excessive wear.

Instances of fractures of this kind are proved conclusively by the fact that the fracture occurred on the compression side of the axle, namely, on the top.

Eliminating Twist on the Axle Case

Where a separate torsion tube or radius bar is fitted a lighter axle will result, because the torque will be resisted by the tube at the center of the axle, eliminating the twisting effect throughout the axle case.

Instances where a cast-aluminum axle tube and casing were used joined in a vertical plane at the axle center, showed that, while the axle as a whole was strong enough to resist bending it would not stand up to the torque stresses and a steel liner had to be put along the whole length on the inside, with provision for transmitting the torque from the axle center to the point of attachment of the springs and hence to the frame.

Where a separate torsion member is fitted the best results of springing will be obtained when both ends are free, which means that the torque members and radius rod will need to such as to keep the axle in its correct relative position to the chassis.

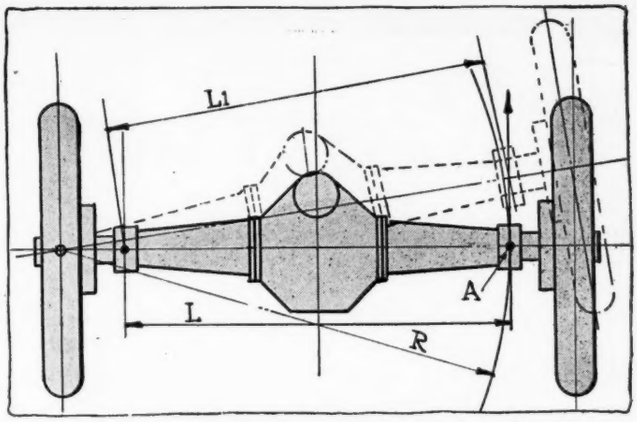


Fig. 2—Diagram illustrating the movement of the axle when one wheel passes over a bump

Single Torsion Member Inadequate

A single torsion tube or member would not suffice. Either two radius rods, one on each side or a triangulated member would have to be used.

Freedom of springing is obviously impaired when the springs are anchored at the forward end to serve as radius members, and a torsion tube is used in addition, as the axle when oscillating is restricted in its line of movement; following an arc of radius equal to the length of the torsion tube, but the path through which it would travel were there no torsion member would be an arc of radius equal to the distance from the spring center and anchored end, which will vary as the deflection. Hence unless these two paths can be made to coincide the springing is impaired.—A. A. BULL.

A Recent Court Decision—Husband Held Responsible

NEW YORK Appellate Division in an extreme case decides that a husband must stand responsible for injuries to a person struck by his automobile while his wife is using the car and chauffeur.

A physician who resided in Albany and owned a car ordered his chauffeur to drive him to a country club. On arriving there he directed the chauffeur to call for him at about 6 o'clock that evening. Late the same afternoon the physician's wife decided that she would drive to the country club and meet her husband there. There had been no arrangement of any kind made as to their meeting at the club and her decision was just made on the spur of the moment. Accordingly, she telephoned to the chauffeur and told him to bring the automobile around for her. He did this and, while she was on the way to the country club the chauffeur discovered an injured woman by the roadside and directed her attention to the injured woman. The doctor's wife ordered the car stopped and, finding that the woman was too badly injured to be moved, she told the chauffeur to go and get some nearby doctor. He did this and, while the doctor was coming back to the injured woman the chauffeur collided with a wagon and the doctor was injured. He thereupon sued the other physician, who was the woman's husband.

The Court held that, under the circumstances, the wife was not exercising exclusive control over the chauffeur but, having had authority to direct him to go for a doctor, her orders to him to do so did not destroy the relation of master and servant otherwise existing between the chauffeur and her husband. The Court therefore held that the husband was liable for the chauffeur's negligence which caused injuries to the doctor, after the jury decided that the chauffeur was the servant of the husband and not of the wife at the time of the accident. All the judges, except one, agreed on this decision; the one who disagreed claiming that, as there was no proof that the husband had hired an incompetent or careless chauffeur, or had a defective car, or even that he had any knowledge that his wife was assisting an injured woman, he was not liable for damages, stating that it would be carrying the rule too far to hold him liable in a case of this kind.

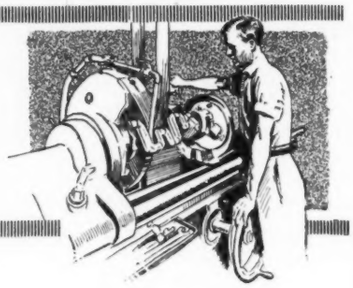
This case rather muddles up things in New York State as regards a man's responsibility for injuries caused by someone employed by him when that person is under the direction and control of a third party. Up to this time the New York courts uniformly held that, in order to render a car owner liable, it was necessary to show that the chauffeur was either acting under the owner's control or was engaged in the owner's business at the time of the accident.

It is to be hoped that the physician in this case will appeal to the Court of Appeals, in which event it would seem likely that the case would be reversed, in view of previous cases on this point decided by this court.—*McHarg vs. Adt*, 149 *N. Y. S.*, 244.

Ford Ships 21,976 Cars in September

DETROIT, MICH., Oct. 28—During September, 1914 the Ford Motor Co., sold and shipped 21,976 cars, or an average of 733 daily. Compared with September, 1913, this year shows an increase of 11,479 cars, while in comparison with last August the increase is 1,338 cars. During the first 2 months of its new fiscal year beginning in August the Ford company has thus shipped 42,614 cars.

The Rostrum



Where Power Is Lost in Automobiles

EDITOR THE AUTOMOBILE:—1—What is the percentage of efficiency of the average modern automobile?

2—What per cent. of the power developed by the engine is delivered at the rear wheels?

3—Explain where the efficiency is lost?

Lebanon, N. Y. CYRIL C. LAWTON.

—1—The efficiency varies greatly with conditions. Assuming that you mean the overall efficiency and not that of the motor, this depends on the road resistance, the wind resistance, the temperature, the efficiency of the motor and driving mechanism. The overall efficiency is the percentage of energy utilized in propelling the car to that supplied in the form of fuel.

Assuming that the car under consideration is one which was tested recently and which averaged 22 miles per gallon when running at an average speed of 24 miles per hour, the weight of the car being 3,230 pounds and the bore and stroke 4.25 by 5.25, the efficiency can easily be calculated if we know the road resistance and wind resistance. Not knowing these, we will assume that the road resistance is 50 pounds per ton and that the wind resistance is calculated.

The total tractive force required is $\frac{3{,}230}{2{,}000} \times 50 = 80$ pounds approximately. This force moves through a distance of 22 miles.

According to the formula given by Strickland, the pressure due to wind resistance is represented by the formula,

$$P = .0025\ SV^2$$

where P = pressure in pounds, S = surface in square feet, and V = velocity in miles per hour. S can be taken as 12 square feet, and the velocity, as previously stated, is 24 miles per hour.

Therefore, $P = .0025 \times 12 \times 24^2 = 17.25$ pounds.

Thus the total force which must be overcome is $80 + 17.25$ or 97.25 pounds. The total work done in foot pounds in moving the full 22 miles is therefore, $97.25 \times 5{,}280 \times 22 = 11{,}300{,}000$ foot pounds. Since 1 B.t.u. equals 778 foot pounds, this quantity is equivalent to $\frac{11{,}300{,}000}{778} = 14{,}600$ B.t.u. The heat in a gallon of gasoline expressed in B.t.u. is about 130,000 and therefore the efficiency is $\frac{14{,}600}{130{,}000} = 11.2$ per cent.

2—The average loss in the gearset on direct drive may be taken as 3 per cent. and the loss at the bevel pinions as 5 per cent. Allowing 1 per cent. for all the other losses the total will be 9 per cent. Therefore in this particular case, 91 per cent. of the power developed by the motor would be delivered to the rear wheels. In other cases the power transmitted might be higher and in others might fall as low as 80 per cent. This is assuming that the car is in high, on second the loss in the gearset may be taken as 6 per cent. This would increase the above estimate by 3 per cent.

3—You do not state whether you mean in the whole machine or just from the motor to the rear wheels. About 70 per cent. of the power is lost to the cooling water and discharged through the exhaust, then there is the friction in the bearings of the motor and the power required to operate the motor auxiliaries, such as the pump, generator, magneto, etc. There is a slight loss in the coupling between the clutch and gearset, and some power is wasted in the gearset, as already noted. A small amount of energy is absorbed by the universals, and the rear axle also requires energy, as previously stated. The rest of the power is absorbed in road friction, and in wind resistance. According to our calculations in answer to your first question, the distribution of energy may be tabulated as follows, the mechanical losses in the motor being calculated by subtracting all the rest from 100.

Lost to cooling water and exhaust heat..	.70
Mechanical losses in motor.....	.10
Gearset losses	.03
Universals	.01
Bevel rear axle	.05
Road and wind resistance.....	.11
	1.00

How to Attach Electrical Meters to Hupp

Editor THE AUTOMOBILE:—1—I have a 1914 Hupmobile with Westinghouse starter and ignition system. Would you kindly explain how a voltmeter and ammeter could best be wired from the dash to the generator. A diagram would be much appreciated.

2—Will you also give me the names and addresses of reliable companies who manufacture ammeters and voltmeters?

3—Can an aluminum transmission case which is cracked, be welded or soldered strongly enough to withstand the continuous strain and jar? I have found that common solder will not adhere to aluminum; how is this accounted for?

Woodstock, Vt. E. H. REED.

—1—The wiring is extremely simple. The ammeter is connected as shown in Fig. 1, it being directly in the path of the current it is to measure. The voltmeter, on the other hand is attached across the two terminals of the generator, because it measures the pressure.

2—Following are a few names taken from the Automobile Trade Directory: General Electric Co., Schenectady, N. Y.; Hoyt Electrical Instrument Works, Penacook, N. H.; Keystone Electrical Instrument Co., Ninth street, and Montgomery avenue, Philadelphia, Pa.; Wagner Electric Mfg. Co., 6400 Plymouth avenue, St. Louis, Mo.; Weston Electrical Instrument Co., Newark, N. J.; Westinghouse Electric & Mfg. Co., Pittsburgh, Pa.

3—An aluminum solder was described in the Sept. 17 issue of THE AUTOMOBILE, page 564. According to the maker, this solder is stronger than the aluminum, and the aluminum will break before the solder will. If the crankcase is welded, it should also be strong enough to withstand the strain.

Edison Storage Battery Lighter

Editor THE AUTOMOBILE:—1—What is the difference between an ordinary storage and an Edison battery?

2—What does each weigh, such a size as is used on a 3-ton truck, and what is the cost of each?

3—Can such a battery be charged while current is being drawn from it? If so, how long will it take and what equipment is necessary to do it.

4—Is there very much difference between these batteries and a battery used for cranking and lighting?

5—Will you publish a list of addresses of manufacturers of garage tools supplies and steel working machinery?

6—What is the address of the Stanley Steam car?

7—What are the objections to a two-cycle motor?

8—Where can an instruction book for Elmore cars be obtained?

9—Why was the manufacture of these cars discontinued?

10—Can gas such as generated from carbide be used in an automobile engine?

11—How many cubic feet of gas and vapor will a pound of carbide produce?

Cooper, N. C. A READER.

—1—The ordinary lead storage battery uses lead plates immersed in an electrolyte of sulphuric acid of a specific gravity of about 1.280, when the battery is charged. The positive plate consists of lead peroxide and the negative plate is sponge lead. Pure lead is used to form the framework of the plates or grids, which carries these two substances, lead and lead peroxide. These grids also carry the current out to the battery terminals.

Edison Uses Potash Solution

The Edison cell on the other hand uses a 21 per cent. solution of potash in distilled water. The positive plate consists of one or more perforated steel tubes heavily nickel-plated, filled with alternate layers of nickel hydroxide and pure metallic nickel in excessively thin flakes. The tube is drawn from a perforated ribbon of steel, nickel-plated and has a spiral lapped seam. This tube, after being filled with active material is reinforced with eight steel bands, equi-distant, which prevent the tube expanding away from and breaking contact with its contents.

The negative plate consists of a grid of cold rolled steel, nickel-plated, holding a number of rectangular pockets filled with powdered iron oxide. These pockets are made up of very finely perforated steel, nickel-plated. After the pockets are filled they are inserted in the grid and subjected to great pressure between dies which corrugate the surface of the pockets and force them into practically integral contact with the grid.

These plates are housed in a jar or container made from cold rolled steel. The container is welded at the seams, the walls are corrugated for strength and the steel is nickel-plated.

Hard to Make Fair Comparison

2—It is difficult to compare these batteries, because the capacities used in various trucks will vary with the make of truck, etc. The only fair way would be to determine how much each type of battery would weigh and cost, to give the same performance in the same truck.

To give you an idea, however, a lead battery for an ordinary 3-ton truck might weigh 2,500 pounds and cost about $500. Such a battery would have an ampere hour capacity of 260 and would give 110 volts, 44 cells being used.

Another truck, of 3.5-ton capacity, however, is equipped with an Edison battery weighing 2,250 pounds, and costing $1,980. This battery has an ampere hour capacity of 375 rated and 475 actual under ordinary conditions of operation. The voltage is 72.

Therefore it is seen that the conditions are so different that little comparison can be made.

3—This is an obvious impossibility and there is no place where it is required. If you attempted to draw current from a battery on charge you would draw from the charging circuit and not from the battery.

4—The only material difference between the different types is that the starting and lighting battery is made of just the right capacity for the work it has to do and therefore it is of much smaller size.

5—This is entirely too long as there are many hundred names on the list. We advise you to write the Automobile Trade Directory, 239 West 39th street, New York City.

6—Stanley Motor Carriage Co., Newton, Mass.

7—The objections to the two-cycle motor are that it is difficult to throttle down, it is uneconomical, and is not as adaptable to high speeds as the four-cycle.

8—Possibly the Auto Parts Co., Chicago, Ill. or the Elmore Auto Repair Co., 247 West 47th street can supply you. These two concerns handle parts for this car and may be able to furnish you with an instruction book.

9—The manufacture was discontinued because the company failed.

10—Yes. Occasionally we hear of a motorist driving home on acetylene gas when his supply of gasoline is exhausted. The objection to the use of this gas is that it is much more expensive than gasoline.

11—One pound of carbide will produce .407 pounds of acetylene and this corresponds to 6.3 cubic feet at 70 degrees Fahrenheit.

Motor Overheats Badly: Water Boils Away

Editor THE AUTOMOBILE:—I have a model 14 Buick runabout. It has a two-cylinder, opposed motor. To date the car has not been run to exceed 1,000 or 1,200 miles. The trouble is it heats the water excessively, using about 1 gallon to every 7 or 8 miles. Have had it overhauled by several and they pronounce it to be in good working order; has good power and it performs satisfactorily, only uses too much water. It has a thermo-syphon system of cooling.

Recently I had a pump installed, but this does not lessen the consumption and heating of water. Have had new 1 1-4-inch hose put in the circulating system and thoroughly traced water course for any stoppage, but none to be found. Seems to boil the water in the jackets like when water is poured on a hot stove. The original radiator was somewhat battered on the inside by the fan wheel getting loose, and I had the radiator reconstructed so as to hold about a gallon more water. It heats as much now as with the original one. So I do not think it is in the radiator as it got just as steaming hot before I had any change made. I have had the timing changed, which has helped the speed and power at least 25 per cent. I use plenty of lubrication but this does not seem to help any.

The maker claims it is all in the radiator, but I do not think so, as the original one heated the same. Would like

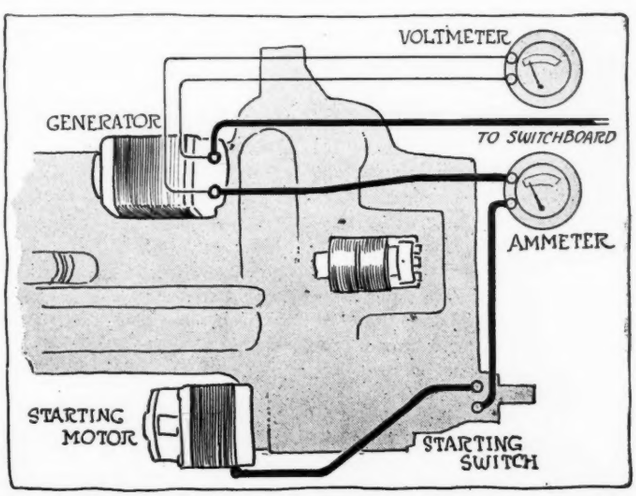


Fig. 1—Diagram showing wiring connections for attaching ammeter and voltmeter to 1914 Hupmobile

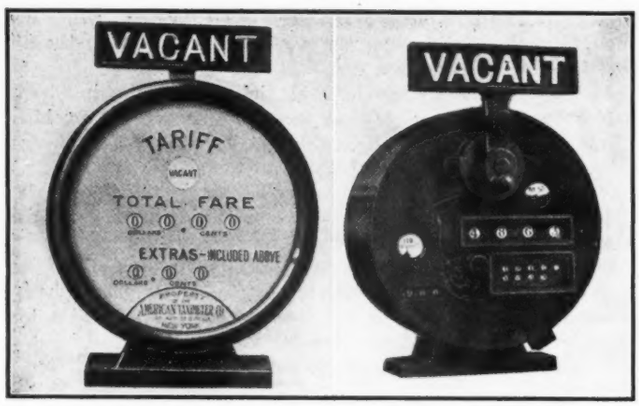


Fig. 2—Front and rear views of a taximeter

to hear from any one who can suggest a remedy for this trouble. Have tried a dozen or more suggestions but with no results. What does THE AUTOMOBILE think is the cause? There is no stoppage in the water circulation; carbureter works well and no misfiring; everything else is all right.

Syracuse, N. Y. A. W. SMITH.

—The Buick model 14 uses a vertical tube radiator, in which the water runs simultaneously through all tubes. If your radiator ever worked properly a repair such as you speak of could not increase its capacity by a gallon. It may be, however, that, prior to the accident a part of the radiator, a tube or two, was closed, and when the radiator was repaired, was opened up. The water capacity of this cooling system is 2 1-2 gallons, and if it does not hold this much, something is radically wrong. It may be possible that while your system is up to normal capacity, the water does not circulate properly, due to an obstruction in the line, perhaps in the cylinder passages. Continued use of hard water may have deposited a scale in the interior of the radiator that prevents proper radiation. To determine which of these is the case, or if none of them, what the real difficulty is, proceed as follows, always remembering that it is not a fault in design but the result of an abnormal condition.

First Drain Radiator

First drain out your radiator and cooling system, refilling it with clean water. Measure the amount that you put in, and if it is not as much as 2 1-2 gallons, you may know that your system is not of normal capacity, due either to stoppages in repairing the radiator, or core sand, or deposit from dirty or alkali water. When the radiator is full start your motor, and let it run until the water is hot, then feel all of the tubes in the radiator. If any of them are cool, they are not circulating, and are probably clogged or closed through an error in manufacture or repair. Next, to test the circulation, disconnect the outlet hose, and with the motor running, put fresh water into the radiator to take the place of the water running from the disconnected exhaust. Drop some aniline color or ink into the radiator, watching the outlet to determine how long it will take it to run through the system. If it comes through greatly diluted, and continues to come long after the last is put into the radiator, there is an obstruction in the passages which allows the water to pass only very slowly, and may be due to caked core sand and scale, or vegetable matter or sand in the water, introduced into the circulation by careless straining of the water. It is barely possible that a lump of iron was left by the core in casting which escaped the notice of the inspectors.

If, after all of these tests, it is found that the cooling system accommodates its full capacity of fluid, that it reaches every surface of the radiator, and that the circulation is rapid and thorough, your over heating must be due to errors in driving, to wit, running on retarded spark, in low gear, or with an over-rich mixture, or to a deposit of scale on the interior of the radiating surfaces which prevents proper radiation. If the former, the remedy is obvious, if the latter, the system should be cleaned with one of the numerous radiator cleaning compounds.

If it is found that the water is not circulating through all of the radiator tubes, the radiator should be thoroughly cleaned and overhauled, and the ends of the tubes inspected if possible. If there are obstructions in the cylinder passages, their nature should first be learned, and if possible immediately removed. If it is found to be a flaw in the casting, it may be necessary to replace the cylinder, if no way can be found of reaching it from the outside.

How a Taximeter Works

Editor THE AUTOMOBILE:—1—Will you please give me the addresses of several manufacturers of taximeters? 2—What sort of a record does a taximeter keep? Does it show anything besides the amount of money taken in? How does the clock attachment work?

I am contemplating starting a taxicab line, but know but little about the working of the meters.

McCook, Neb. ROBERT L. FERGUSON.

—1—According to the Automobile Trade Directory, taximeters are made by the following concerns: American Taximeter Co., 735 Seventh avenue, New York City; International Taximeter Co. of America, 239 West 68 street, New York City, and the Pittsburgh Taximeter Co., Center and Negley avenues, Pittsburgh, Pa.

2—There are two principal types, the one-tariff meter which registers at but one rate, and the two-tariff meter which will permit of charging at one rate for one or two passengers, and at a higher rate for three or more. Provision is made for additional charge for baggage, etc., under extras. This record is rung up by the driver and shown separately on the dial.

In some meters the extras are automatically added to the total fare, while in others the totalizing feature is omitted, the extras being computed separately.

When the cab is disengaged, the flag on the meter is upright, displaying the vacant sign. Upon a passenger being taken, the flag is turned to the right 90 degrees, or one-quarter of a circle, and the figures Tariff One and the initial fare appear upon the dial. In this particular case for instance, the initial charge is 50 cents. This will carry the passenger the first half-mile, at the end of which the meter will record an additional charge of 10 cents for every quarter-mile thereafter, and 10 cents each 4-minute period of waiting time. Any other rates of fare may be had.

Where it is desired to use Tariff Two—for a larger number of passengers—the flag is turned around three-quarters of a circle, to a position opposite to that of Tariff One. This will cause the figures Tariff Two and the initial charge of 50 cents to appear. The initial charge will in this case cover the first one-third mile, registering 10 cents additional for every one-sixth mile thereafter. Waiting time is recorded as the same time as Tariff One—10 cents for each period.

At the termination of a trip the flag is turned to the lowest point of its travel. This is the Not-Recording position. The dial reading Total Fare, and Extras is unchanged, but the words Not-Recording appear instead of Tariff One or Two. The clock is disconnected from the Total Fare reading, preventing the automatic addition of money for waiting time while the passenger is in the act of paying his fare.

The Non-Recording position is also used in the event of mishap to the cab, necessitating repair or the procuring of a substitute cab, in which case the passenger is not responsible for the loss of time, and would naturally object to paying for it.

Should the driver attempt to operate with passengers, the flag being in the Not-Recording position, additional fare and mileage will continue to record. Upon the fare being paid, the flag is again moved to the Vacant position, the dial is returned to zero, and the meter records only the total mileage when the cab travels, until another passenger is taken and the flag again operated.

The Owner's Record

The rear face of the taximeter contains the owner's record. It is permanent and is not returned to zero by the movement of the flag after each trip, but continues to register all additional fares, mileage, etc.

The circular dial in the upper right side shows the number of trips, or times the flag has been operated from Vacant to Vacant. Below this is the permanent cash record, or total amount of the fares, including Extras received. This is read backward. For instance, the figures 4863 would mean $368.40.

Mileage is registered in miles and tenths in two lines of numerals in the lower right side. The top line records total mileage. The lower line total paid, or live mileage. Unpaid mileage can be easily found by subtracting the lower amount from the upper.

The small circular dial on the left registers the time in 1-minute periods that the flag is in the Not-Recording position.

Recording of Extras

Extras are recorded in the oblong space on the lower left side. They are also included in the cash record. The separate recording of this item will prevent any abuse of the Extras feature on the part of the driver.

The flag may be locked in any of its positions, preventing tampering by malicious persons in the possible absence of the driver. The locking, registration of Extras, and winding of the clock, are accomplished by means of a key furnished for these purposes.

Advantages of Friction Drive

Editor THE AUTOMOBILE:—Has there ever been published in THE AUTOMOBILE an article on the advantages and disadvantages of the disk-friction-chain drive compared with other types of transmission now more commonly used? If so, would you kindly give me the reference? If not, will you please give me your views on the subject?

Ithaca, N. Y. FRANK E. RICE.

—Nothing has been published on this subject in the past few months. The advantages of the friction transmission are that it offers an infinite number of gear ratios, is silent, cheap to manufacture and simple. The disadvantages are that the friction disk must be renewed every few thousand miles; this is a small matter, but worth noting; and that the amount of horsepower that it will transmit under the conditions found in automobile design is limited. Therefore it has never been used to any extent on large cars but has found favor on some cars of medium size and on more small cars.

Not Advisable to Change Gear Ratio

Editor THE AUTOMOBILE:—I am the owner of a 3,000-pound car, having a bore of 4 1-8 inches and stroke 4 1-2 inches with tires 34 by 4 and a gear ratio of 3 3-4 to 1, and am desirous of changing it to a 4 to 1 gear ratio. Would you please explain the difference between the two ratios relative to this car in regard to vibration, heating and wearing of engine parts, gasoline mileage, hum in differential and other advantages or disadvantages between the two ratios?

This car shows no vibration at 30 miles at present ratio. Am in the habit of running 15 miles per hour.

Waltham, Mass. C. A. DUBOIS.

—There will be little difference in these two ratios, the lower one will require that the motor run 1.066 times as fast, and this will increase the noise, vibration, heating, wearing, and gasoline consumption just that much.

This difference is not worth the change as it will cost a considerable amount to put in the new gear ratio. A new pinion and gear will be required and if these cannot be obtained from stock it will be necessary to make them up specially at additional expense.

If your car is in good condition, there is no reason why you should discard the gear ratio you now have because the motor should be powerful enough to make the car a good hill-climber. However, if you desire a lower gear it would be better to install a 4.5 to 1 ratio, as this will make a noticeable difference.

Bent Knuckle Hard to Repair

Editor THE AUTOMOBILE:—1—Please advise me regarding an argument which we had in our shop lately.

We had a steering knuckle on a Buick car which required straightening. I argued that it could be done either cold or by heating and that heating would do no harm, but on the other hand would lessen the danger of crystallization.

Other parties argued that heating would allow it to bend easier in the future and that no good machinist would do it any way but cold.

Titonka, Ia. VICTOR LAMOREUX.

—If the knuckle is straightened at all it should be done hot. It is better to put in a new one, however, as it is difficult to straighten it so that the wheels will run true. If the bend is in the spindle there is no possibility of straightening it satisfactorily and even if only the arm is bent it will be hard to true it up.

Buy New Set of Ford Magnets

Editor THE AUTOMOBILE:—I am under the impression that I saw a letter in THE AUTOMOBILE explaining a method of charging Ford magneto magnets without taking them out. If you have published such a letter, I would be pleased to have a copy containing it.

Fairchance, Pa. CARL LIGHTFOOT.

—We have never described such a device. Recharging these magnets is hardly worth the trouble because a new set may be purchased complete and ready to install for a total expenditure of about $4.

Will Water Remove Carbon?

Editor THE AUTOMOBILE:—I note in THE AUTOMOBILE that someone advocates dropping water in the carbureter when the engine is hot and running to remove carbon. I heard of this several years ago but dared not try it until recently. I thought it worked well. What do you think?

Portland, Me. GEO. W. CHASE.

—We have had no experience with this method of removing carbon. Possibly some of our readers have tried water and will give their experience.

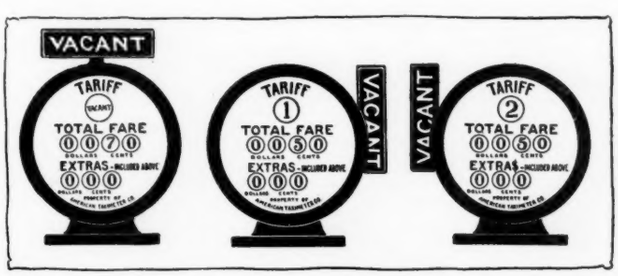


Fig. 3—Three positions of the flag. At the left is the position when the cab is vacant, in the center is the position for tariff 1 and at the right for tariff 2

The Engineering Digest

Control of Materials and Dimensions in German Manufacture of Steel Balls and Ball Bearings

A SUBJECT BEARING UPON AMERICAN INDEPENDENCE OF IMPORTATIONS

THE means adopted by the Deutsche Waffen- und Munitionsfabrikken in Berlin to secure uniform qualities of the materials used for balls and ball bearings and uniform accuracy in the dimensions of these products are described by W. Bockermann.

From 1898 to 1909 the D. W. F. concern conducted its scientific investigations of problems arising in the manufacture of steel balls and bearings in connection with the Zentralstelle für Wissenschaftlich-technische Untersuchungen (Central Institution for Scientific-technical Investigations) at Neubabelsberg near Berlin. Its own testing department for materials was established in 1910 and was combined with the department for the mechanical testing of the products, which had already existed for about ten years and which was enlarged on the same occasion.

The mechanical laboratory, Fig. 1, comprises a Martens-Heyn hardness tester, a Brinell press for testing hardness, an Amsler-Laffon press of 60 tons capacity with an auxiliary cylinder of 6 tons pressure; also a press of 200 tons capacity. To the right in the illustration there is seen a machine for grinding and polishing of test pieces for metallographic examinations and in the background a device for the control of the accuracy of pyrometers. The microscopes are all made by Carl Zeiss of Jena and include a measuring-microscope for the hardness tests, a large metallurgical microscope and a binocular microscope [to give the perspective effect of the etched portions of polished test pieces—ED.]. A Martens mirror is at disposal for measuring deformations during testing operations.

Figs. 2 and 3 give an idea of the equipment of the chemical laboratory, showing respectively the titration room with the analyzing room behind it and the electrolytic plant with device for burning carbon electrically. Some of the mechanical testing devices for the finished product may be recognized in Fig. 4, while Fig. 5 shows the arrangement of the ball inspection department.

The chemical analysis of some of the steels used for balls and races is given in an appended table.

Percentage of	Balls up to .5 in. diam.	Balls above .5 in. diam.	Races.
Carbon	1.23	0.95	1.01
Manganese	0.31	0.29	0.26
Silicon	0.16	0.36	0.23
Phosphorus	0.017	0.028	0.020
Sulphur	0.015	0.028	0.020
Copper	0.012	0.01	0.008
Chromium	——	1.25	1.33

Material is received, according to its purpose, in the form of wire, rods, tubes, disks or blocks. Samples are taken from every lot and are examined with regard to chemical composition, texture, natural hardness and hardness as well as toughness after hardening by heat treatment. There is demanded a material free from cracks and pores and showing a microstructure of fine-grained perlite. The best test for hardness has been found in the Brinell method of measuring the indentation made by pressing a steel ball into the material. But this test is not made with a ball of 10 millimeters diameter and a pressure from 2,000 to 3,000 kilograms, as is usual, but with a 5-millimeter ball and 500 kilograms pressure. Under the higher loads the hardened material frequently developed superficial cracks, and these may be very detrimental for the durability of a ball bearing. This does not occur with the smaller ball and the 500-kilogram load. The conditions for obtaining reliable results by this method comprise: a press working perfectly, balls of uniform hardness, a good polish of the surface where the indentation is made, a delicate film of lampblacking, correct

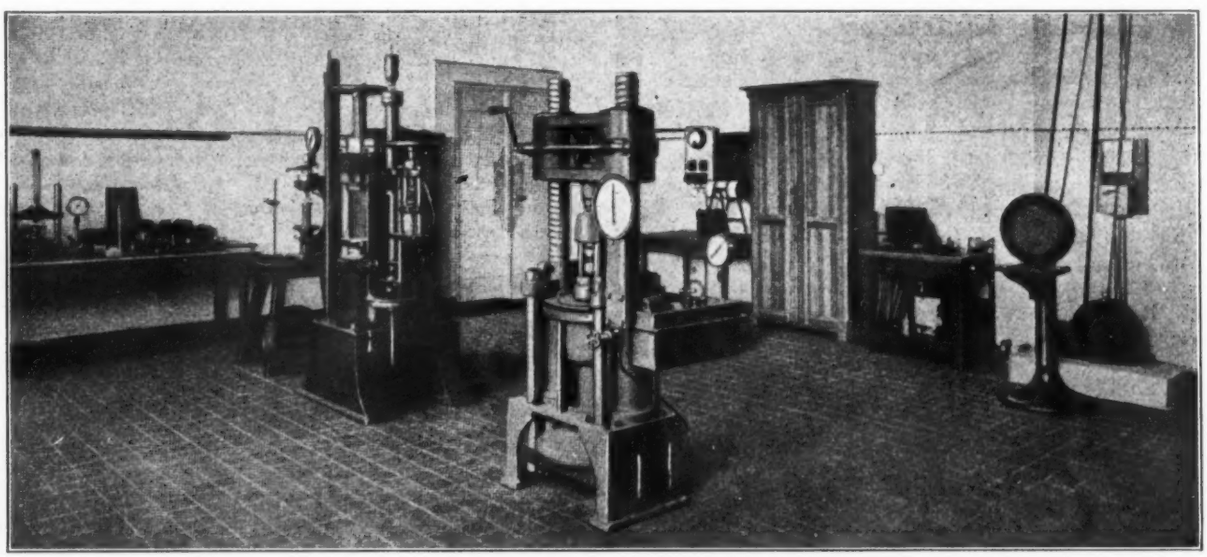


Fig. 1—Mechanical laboratory with presses for testing raw materials for hardness and toughness; also micrographer equipment

adjustment of the microscope (so that the planes of the image and of the crossing threads coincide accurately), a suitable illumination and, finally, practice on the part of the workers. The balls used for the press are made specially for this purpose and of unusual hardness, which is the property that is most essential, but their toughness is thereby somewhat reduced and the number of wasters is increased.

The determination of the toughness of the hardened steel gains additional importance from the fact that the results indicate how well the material has been handled at the rolling mill. This property is measured by bending tests, and these are also directly useful, as the chief stresses to which a ball bearing is subject are pressure and bending stresses.

The examination of the materials is continued during the processes of manufacture. Each bearing ring is measured and inspected for defects after each machine operation and each process of heat treatment. After the hardening the rings are tried searchingly for hardness and toughness. Each ring is tried for hardness in several places with a three-cornered file and thereafter it is dropped on a steel plate from a height of 2 meters. Those which are too brittle are broken by the fall.

The bearing balls are, as a rule, not inspected till finished. By the play of light and shadow when the balls are moved around on a glass plate, defects of material or workmanship become plainly visible, and balls seen to be defective are of course put aside by the young women doing this work, (Fig. 5.)

Rings and balls are often tried for hardness, toughness and strength. The toughness of rings is determined by compressing them radially between two flat plates. Hardness of balls is tested by pressing two balls of equal size against each other. In the case of large balls, which preferably should not be destroyed by the test, the load applied is $5D^2$ kilograms, where D stands for the ball diameter in one-eighths of an English inch, so that the load for a 2 1-2-inch ball, for example, becomes $5 \times 20^2 = 2{,}000$ kilograms. By this load no measurable permanent deformation arises. When the value of the test-object is of no importance the hardness is decided with loads from $50D^2$ to $300D^2$.

The toughness of the balls is also determined by pressing two of them against each other. They are placed in a guide block, one over the other, as in Fig. 6, and loaded to destruction. It is an interesting observation in connection with this test that, when a cone whose base equals the area of contact between the two balls is driven in between them, only one of the balls, as a rule, is destroyed at first. The other one bursts frequently at the moment the load is removed, into two even halves, but it also happens often that it does not burst till after a considerable length of time, which may be hours and even days, and then with a distinctly audible report. Fig. 7 shows a pair of balls destroyed in this manner, together with the shearing-cone.

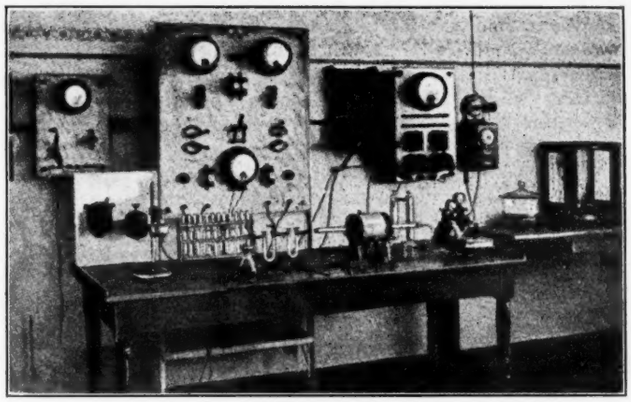


Fig. 3—Plant for electroplating and determination of carbon contents

The ultimate load for balls varies within rather wide limits, but this is not so objectionable as might appear at first thought, as it is the balls which for some reason—slight variations in the hardening temperature—have become least hard which show the greatest ultimate load. When this load is taken as a measure for toughness, the hardness should therefore at the same time be considered. A high ultimate load is only then a sign of satisfactory toughness when the hardness is also sufficient.

In the department for the testing of the steel materials the other substances which are used are also examined, such as bronzes, brass, oils, benzine, soaps and paper, and these examinations relate mainly to the properties required in these materials for their use in connection with ball bearings. [The author here refers to the ball cages, whose metal should not wear off on the balls and should hold their shape and their cross-pins, to lubricating oils, etc., which should be free from acidity, and to the avoidance of hygroscopic properties in the wrappings for ball bearings held in stock.—Ed.]

The Control of Dimensions

Aside from the accuracy required in the machine tools by which the parts of ball bearings are turned out, a large and varied collection of fine measuring tools is a necessary equipment, and in order to keep these fine tools constantly up to a high standard of accuracy a measuring department has been established.

A considerable wear of the measuring tools follows from

Fig. 2—Titration room with chemical analysis room adjoining

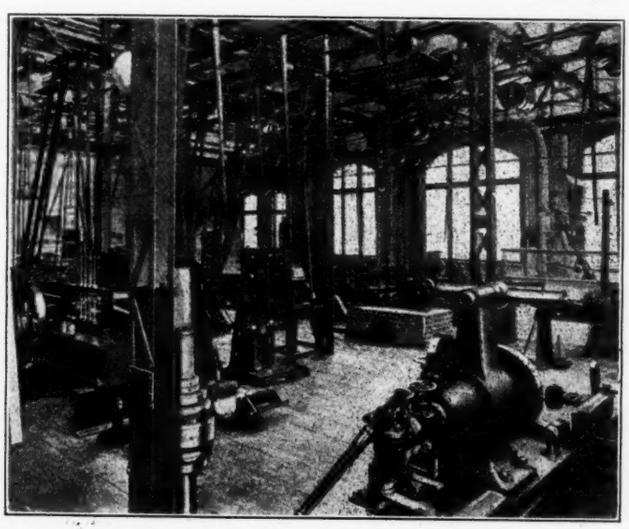


Fig. 4—Equipment for mechanical testing of finished bearing rings

the fact alone that the tolerances allowed in the manufacture are very small, so that much rubbing takes place. The tolerance for the bore of a bearing ring does not exceed 0.015 millimeter, and the same accuracy is required for external diameters up to 50 millimeters, increasing to 0.02 for rings of larger dimensions; for balls the variations must not exceed 0.002 millimeter. Naturally the manufacture is operated from beginning to end with tolerance calipers and rules, and these are produced and calibrated at the factory. The

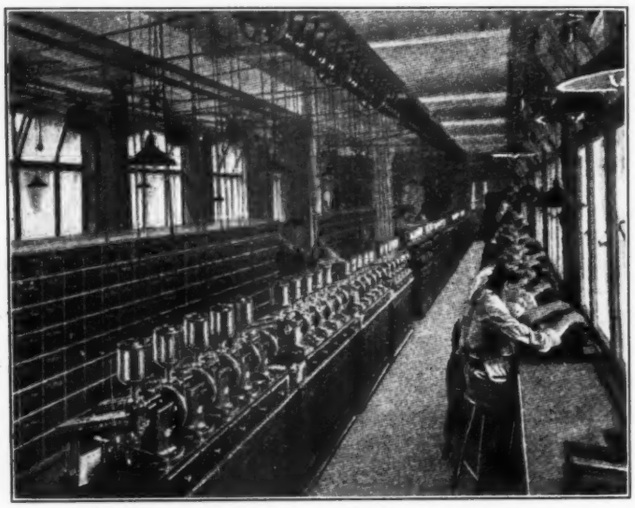


Fig. 5—Testing of steel balls by play of light

calibration is done in the measuring department by means of the following machines:

(1) A measuring machine from I. E. Reinecker of Chemnitz, with a range of about 300 millimeters. To this machine belongs a set of Reinicker measuring blocks in lengths from 5 to 100 millimeters. These blocks are tested by the Physikalisch-Technische Reichsanstalt with an accuracy of plus-minus 0.001 millimeter and are revised from time to time in the same place. Up to lengths of 50 millimeters an accuracy down to even 0.0005 is guaranteed. To go further seems unnecessary, as a difference in temperature of only 1 degree centigrade makes a differnce of more than 0.001 millimeter on a length of 100 millimeters.

(2) A Sauter & Messner measuring machine of the same range.

(3) A device for measuring thickness, from Carl Zeiss, with a range of 105 millimeters. The two other measuring-machines apply a pressure, when used, of respectively 4.2 and 5 kilograms on the work piece, and this pressure in some cases would interfere with accuracy. Thin rings, for example, are ovalized by it and balls are flattened at the measuring places. While these minute deformations lie within the elastic limit and have no permanent effect upon the actual dimensions of the work piece, it is a matter of experience that they result in the diameter of such pieces being regularly measured too small. With the Zeiss measure this drawback is avoided, as the pressure is only 0.09 kilogram.

(4) A thickness and ovalization measure with minimeter from Hirth at Cannstatt. This device, like the measuring-machines, must be adjusted by means of the measuring-blocks, and the range for each adjustment is rather small and depends upon the individual minimeter that is used. With a multiplication of 1 : 500 the range is only 0.04 millimeter. The instrument is therefore mainly used for measuring tolerances.

(5) Two standard sets of Johannson measuring blocks, of which one is used constantly while the other serves for controlling the first one.

(6) An extension set of Johannson blocks in lengths from 150 to 300 millimeters.

The Reinecker measuring-machine is protected by a glass case against dust and changes of temperature, and the measuring-room where it is kept has northeast exposure, an outside wall 50 centimeters thick and double windows, so that the temperature can be kept almost constant.

For trying out complaints there is in the measuring-room a complete set of tolerance calipers from 5 to 100 millimeters of an accuracy of plus-minus 0.001 and adapted for measuring all of the tolerances guaranteed in the firm's catalogs. It is found advantageous to have complaints thus passed upon apart from the commercial offices.

The normal temperature is assumed to be 20 degrees centigrade; that is, all measuring-tools agree exactly with their nominal dimensions at this temperature. While in scientific institutions the normal temperature is taken as 0 degree, most large concerns have found it unpractical to adopt this standard, as it is very seldom that a piece of work can be measured at this temperature, while it is comparatively simple to keep the measuring room at 20 degrees, thereby avoiding calculations or reference to tables.—From *Zeitschrift des Vereines Deutscher Ingenieure*, August 15.

(*To be continued*)

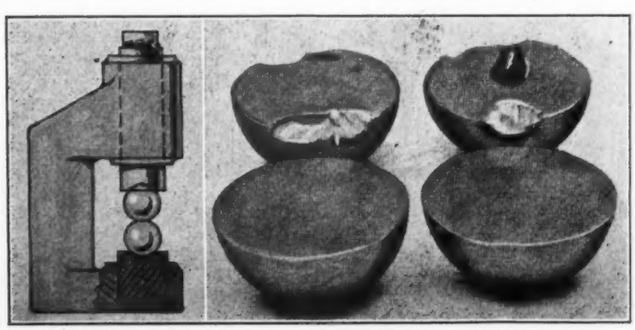


Fig. 6—Ball press for toughness test. Fig. 7—Test illustrating that two balls are never of equal strength

Dividing Germany's Export Trade

IN discussing the best means for securing the export trade which Germany has established all over the world, and not least in France, England and Russia, the French and English technical and class journals furnish many interesting figures to show the volume of the trade involved. It is noticed that the total German exports in 1912 amounted to about 2,240 million dollars of which 38 per cent. went to the nations with which she is now at war. The machinery trade represented 170 million dollars and during the first six months of 1914 electric machinery alone brought Germany more than 35 million dollars. The steel export aggregated in 1912 more than 140 millions, coal the same amount, cotton fabrics 106 millions and leathers nearly 60 millions.

During the same year, however, the German importations amounted to about 2,700 million dollars, and when it is assumed that it should be possible to capture most of the German export during the war and to hold it afterwards, the purchasing capacity indicated in the German importations should also be considered; that is, means should also be discussed for taking from those countries which have traded with Germany an amount of goods similar to that which Germany had to buy from them in order to establish a practicable trade balance, without which the purchasing capacity ceases to exist.

The demands of the situation thus revert curiously to those existing two generations back, when shipowners or captains bought suitable cargoes for speculative export to some foreign port and were prepared to take suitable return cargoes for their home country or intermediate ports—the days when commercial adventure filled the place since taken by commercial organization and international banking facilities.

Two views of the new Twombly taxicab to sell for $600. The passengers have an unobstructed view because the driver sits in the center

Twombly Taxi $600

Maximum Rate 25 Cents Per Mile —Four Cylinders and Sliding Gears

TAXICAB transportation for two passengers at a cost of 25 cents per mile is the maximum rate allowed for the new cab manufactured by the Twombly Car Corp., Nutley, N. J. This cab, which was briefly described in the October 22 issue of THE AUTOMOBILE, is a well-finished landaulette design, painted maroon and upholstered in cloth. The low charge for passenger transportation is due to the fact that there is no excess weight, the car complete tips the scales at 1,400 pounds it is claimed and the initial cost is low, being $600. The motor is a four-cylinder water-cooled design. The wheelbase is 100 inches, the tread 44 and the tires measure 28 by 2.5 inches.

Realizing that if these cabs were sold outright without any restrictions many short-sighted owners would charge the same rate that present taxicab operators are charging, the Twombly company will not actually sell these cars but will give a perpetual lease which allows the owner of the lease all the privileges that a purchaser would have with the exception that if more than 25 cents per mile is charged the cab may be taken back. The operator of the cab may charge as much less than this rate as he sees fit.

This small, light-weight, two-passenger cab was designed, it is stated, after studying the taxicab situation in New York City, where it was found that 80 per cent. of the time not more than two passengers were carried.

Running Expenses Low

The actual running expenses of this cab are extremely low, and guaranteed to be not over 1 5-8 cents for gasoline, oil and tires. It should actually be much below this figure. Probably for the first time in history, it is claimed, a tire company has agreed to guarantee the tire cost to be not over 5-8 cents per mile and the Twombly company guarantees that the consumption of gasoline will not exceed 1 cent per mile.

It is expected that within a few months, a fleet of cabs will be operating in New York City, the charge for the first mile being 25 cents and 5 cents for every quarter mile thereafter. This is just half the present rate. These cabs are to be operated by an independent company. The Twombly company is confining its efforts entirely to manufacturing.

It is anticipated that with the increase in popularity of these low-rate cabs that there will be sufficient of them on the streets and sufficient demand for them, to eliminate the loss due to returning to the cab stand empty. At present, the taxicabs start from the stand, deliver their fares and return empty, the return trip is a dead loss. By reducing the rate, the demand will increase, and with it the number of vehicles with the result that near the spot where the fare is delivered a new fare will be picked up. In this way the cab will eventually work back to its stand, and pay its way while so doing.

L-Head Block Motor

The motor is an L-head, block design, 2.75 by 4 inches. Cooling is by the thermo-syphon system, a honeycomb radiator being used. Lubrication is by a combination splash and force-feed system.

The rear axle is fitted with New Departure bearings and the differential action is obtained by the use of roller clutches. The front axle is a drop-forged, I-beam type with annular ball bearings in the wheel spindles. There are two brakes on each rear wheel, the service being external and the emergency internal.

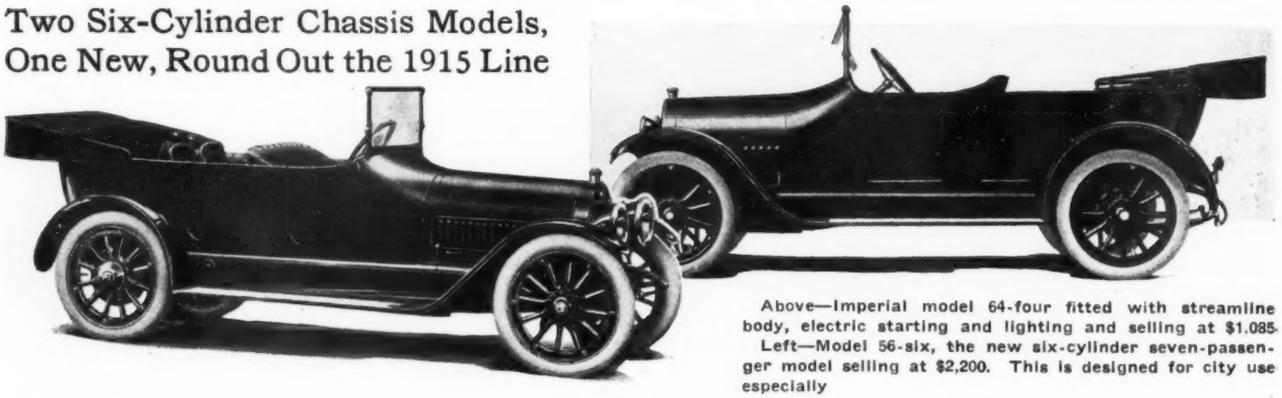
The steering gear is an adjustable design which the driver can swing out of his way when getting in or out. A 14-inch wheel is used and the gear itself is an irreversible worm and sector type. There is a hand throttle on the dash and a foot accelerator. The service brake is pedal-operated, and the other is actuated by a lever.

The top is a patented design which may be raised or lowered by one man in 30 seconds. The front is inclosed by two glass windows through which a full view of the road can be had by the passengers, because of the central position of the driver. Provision for baggage is made by installing a substantial trunk carrier in the rear.

Rear view of cab showing trunk rack

New Imperial Streamline Four at $1,085

Two Six-Cylinder Chassis Models, One New, Round Out the 1915 Line



Above—Imperial model 64-four fitted with streamline body, electric starting and lighting and selling at $1,085. Left—Model 56-six, the new six-cylinder seven-passenger model selling at $2,200. This is designed for city use especially

A FOUR- and two six-cylinder models comprise the 1915 line of the Imperial Automobile Co., Jackson, Mich. Model 64-four is the feature, listing at $1,085 or $415 lower than the previous four-cylinder model. It has a 115-inch wheelbase, 3 3-4 by 5 Continental L-head block motor rated at 22.5 A. L. A. M. horsepower, Gray & Davis starting and lighting system, thermo-syphon cooling, cowl fuel tank and streamline body with rounded radiator. Gills in the bonnet sides, smooth doors, concealed upholstery and well designed fenders add to its appearance.

The four-cylinder type mentioned and the 56-six listing at $2,200 are new models. The other six, model 44, selling at $2,000, is practically a continuation of the same model of 1914, except that many minor refinements have been made and the new type of body entirely alters its appearance. Continental motors with the cylinders cast in threes are used in the sixes and the streamlines of the bodies are consistent in all models.

The chassis of the four has a strong and light appearance with well-proportioned springs carrying the frame.

The motor has the gearset in unit, the whole being three-point suspended in the frame. The crankcase has two integral supporting arms at the rear while the front support is at the center. The usual aluminum crankcase construction, with the upper and lower parts horizontally split, is used. Valves are all on the right and inclosed by two cover plates. The exhaust header also is placed on this side, there being an individual opening into each cylinder from it. But the intake passages are cored in the cylinder casting and pass across to the left side, where they unite into one opening to the carbureter intake pipe. This has the advantage of simplicity outwardly and at the same time serves to heat the incoming gases which is a factor in efficient vaporization of the fuel.

Light-Weight Parts

The working parts of the motor are well balanced and their weight has been made as light as possible. The pistons, cast from the same grade of iron as the cylinders, are each fitted with three diagonally split rings, while oil grooves are turned in their surfaces to aid in oil distribution. I-beam connecting-rods attach to the pistons by means of steel tubing pins which are fixed in the pistons.

Low carbon steel is used for the camshaft, also a three-bearing proposition with integrally forged cams. This is driven from the front by the usual timing gear train, the gears being helically cut and completely housed. Conventional poppet valves are used.

The cooling of this engine is by thermo-syphon. Lubrication is of the combination force-feed and splash variety with a horizontal plunger pump, driven by an eccentric from the camshaft, forcing oil through copper tubes direct to the timing gears and front main bearings and over the rear main bearing. It then drains back into the oil pan.

Gasoline Tank in Cowl

The gasoline system of this car is new to Imperial practice in that the cowl type is used. A 10-gallon reservoir located in the cowl supplies the carbureter by gravity. The Atwater Kent Unisparker type of ignition is employed, this automatically adjusting itself to the speed of the engine.

In their application to the Imperial four, the Gray & Davis cranking and lighting units occupy their usual positions, the generator being driven by the external shaft connected to the front gears and on the right side of the engine. The cranking motor, which spins the engine at about 150 revolutions a minute, is placed so as to gear to the flywheel rim.

Unlike the preceding Imperial fours, the model 64 delivers its power to the rear through an uninclosed driveshaft. The intermediary members are a multiple steel disk clutch and three-speed selective gearset, both in unit with the engine.

The axle is a floating type which is fitted with Hyatt spiral roller bearings. Its axle shafts are removable without disturbing the rest of the construction. Twelve-inch brake drums with internal expanding and external contracting brakes are provided.

The spring suspension of this car is noteworthy on account of its easy riding properties. Seven plate oil tempered three-quarter elliptic rear springs 50 inches long and underslung from the axle suspend the rear of the chassis, while 38-inch springs of six plates take care of the front. All leaves are 2 inches wide.

Wheels are of the usual artillery wood type, to which are fitted Detroit demountable rims. They carry 32 by 3 1-2-inch plain tread tires.

The equipment includes a one-man top, electric horn, speedometer, windshield, dash lamps for illuminating the gauges and instruments, etc.

The New Six-56

The Imperial company characterizes this model 56 as a city car, although its seven-passenger commodiousness and luxury seem to invite the motorist to country roads as well.

A 3 3-4 by 5 1-4 engine of 33.8 A. L. A. M. horsepower is mounted on a chassis of 130 inches wheelbase. Its motor is somewhat different in general design from the four. The cylinders are cast in sets of three, valves are on the right and though integral crankcase arms support it in the frame

at the rear, an arched cross member at the front serves as a support from which to hang the front center of the crankcase. The gearset is in unit, giving three-point suspension.

The crankshaft and camshaft are on three bearings, while drive of the camshaft and the magneto shaft are by helical gears. A silent chain runs from a sprocket on the crankshaft to the generator shaft sprocket on the left.

Cooling by Centrifugal Pump

Cooling by centrifugal pump in conjunction with a large cellular radiator is used, while lubrication is maintained by a force feed splash system whereby constant level in the troughs is insured by pump. The electric functions of cranking and lighting are cared for by a North-East combination motor and generator, driving through silent chain to the front of the crankshaft. This unit, with its two windings, acts first as a motor to start the engine, after which it becomes a generator for charging the storage battery and operating the lights.

A disk clutch connects the drive parts to the engine, while the gearset affords the usual three-speed changes ahead. The gears used are chrome vanadium and they are carried on nickel-steel shafts mounted on annular ball bearings. But unlike the new four, the propeller shaft is inclosed within a torsion tube which takes drive and torque. This shaft is 1 3-8 diameter, of chrome-nickel steel.

The rear axle is floating and has a malleable housing. Like the propeller shaft, the axle shafts are chrome-nickel steel. Their diameter is 1 1-2 inches. The axle ratio is 3 7-8 to 1. The brake drums are 16 by 2 1-4 inches.

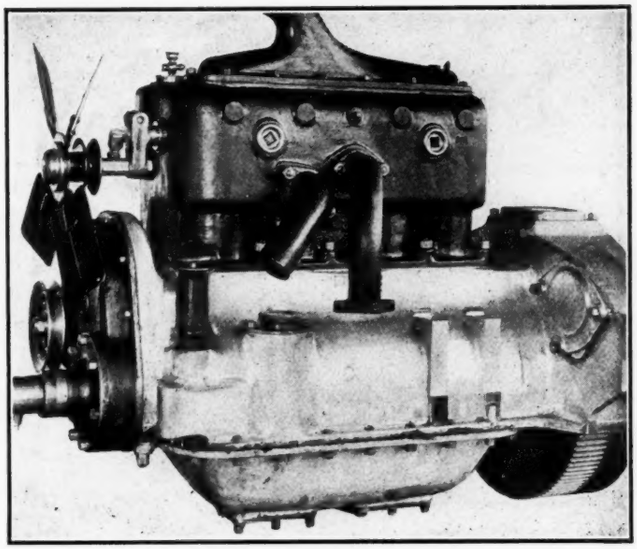
Body work on this car is specially attractive, the full streamline effect being carried out. The upholstery does not protrude over the top edges, and with clear running boards, doors with concealed hinges and inside handles, the outward appearance is exceedingly trim.

The wheels are fitted with demountable rims, and carry 36 by 4 1-2 tires all around. Complete equipment, which includes a one-man top, windshield, speedometer, electric horn and so on, is furnished. Left drive and center control are used, and the 20-gallon gasoline tank is carried at the rear. It feeds by the vacuum supply system to an auxiliary tank, and thence by gravity to the carbureter.

Model 44-Six

The other Imperial six, model 44, is a continuation of the same model of last season with new body. The motor, drive parts, etc., are the same as in the six just described. With its wheelbase 4 inches less—126 inches—this car carries a five-passenger body somewhat similar to that mounted on the 56. The inclosed driveshaft gets its power through a disk clutch and three-speed gearset. The floating rear axle has a ratio of 3 1-2 to 1, its housing being a pressed steel type rather than of the malleable form as used on the other six.

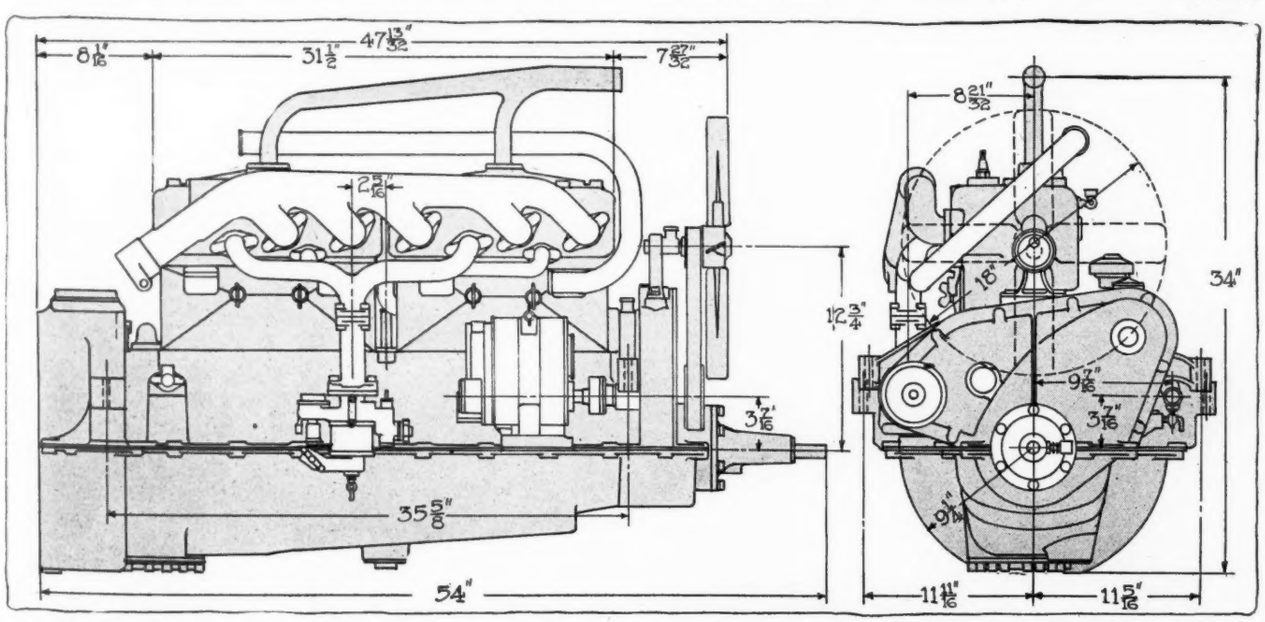
This model also has North-East cranking and lighting, carries complete equipment and uses 36 by 4 1-2 tires.



Four-cylinder Continental motor used on Imperial 64-four for 1915, showing clean design. Note large water passages for thermo-syphon cooling

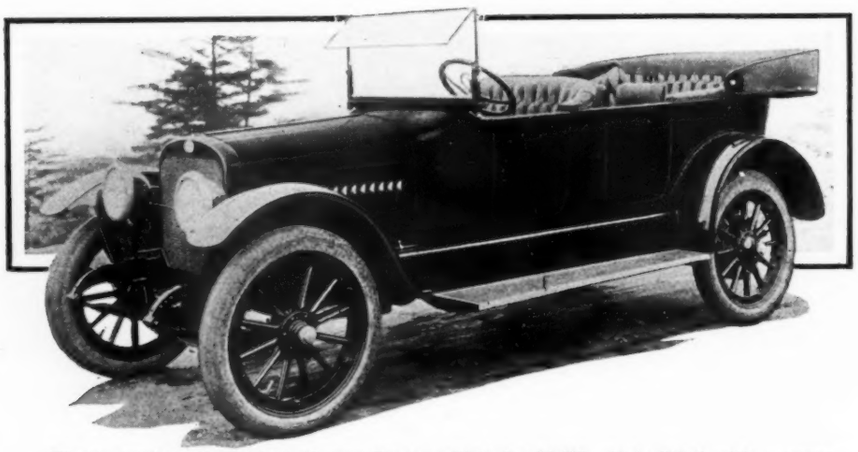
Principal Dimensions of Motors in 1915 Imperials

PART	FOUR	SIXES
Valve diameter	1 11-16	1⅞
Crankshaft front bearing	2 3-16 by 2⅞	2 by 3¼
Crankshaft center bearing	2 7-32 by 2½	2¼ by 3
Crankshaft rear bearing	2¼ by 3	2 by 3⅞
Camshaft front bearing	2 19-32 by 1½	2¼ by 2⅝
Camshaft center bearing	2⅝ by 1⅛	2 by 1⅞
Camshaft rear bearing	1½ by 1¾	1¼ by 2⅛
Piston pin bearing	1 3-32 by 1½	1 7-32 by 1⅞
Piston length	3¾	5
Connecting-rod bearing	1⅞ by 2 3-16	1⅞ by 2⅛



Left—Side view of six-cylinder Continental motor used in 1915 Imperial models 56-six and 44-six, showing cylinders cast in threes and arrangement of manifolds. Right—Front view of the same motor

Enger Six to Sell for $1,495



Three-quarters front view of new Enger selling for $1,495. It is fitted with a seven-passenger body

1915 Model Has 50-Horsepower Motor and Weighs 2,865 Pounds —Standard Parts Used Throughout— Seven-Passenger Body Used

A SIX selling for $1,495 and equipped with a motor rated at 50 horsepower is the offering of the Enger Motor Car Co., Cincinnati, O., for 1915. The motor has a bore of 3.5 inches and a stroke of 5 inches, and is combined with clutch and gearset to form a unit construction supported on three points.

The weight of the car is 2,865 pounds, fully equipped with top, windshield, battery, lamps, starter, speedometer, tools and extra rim. The wheelbase is 124 inches and the clearance 10 inches.

A comfortable body of the streamline type, with gradual curves from front to rear, is mounted on the chassis. The body is capable of seating six or seven passengers, there being space for two or three on the back seat and two on auxiliary folding seats.

The running boards are clean of all obstructions, the tools being carried under the rear seat while the storage battery is hung from the frame. The slope of the cowl is unbroken as the side lights have been done away with, these being combined in the headlights.

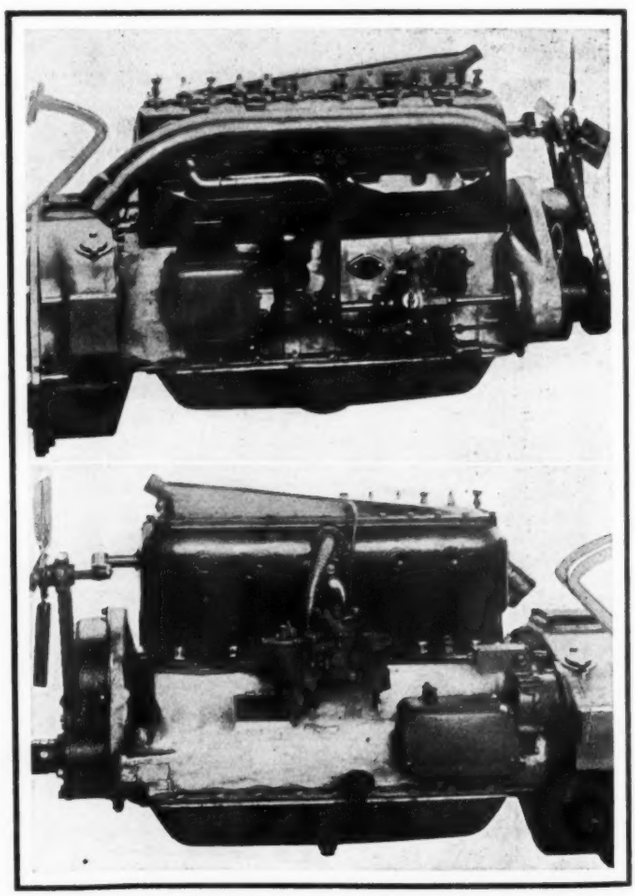
One-Man Top

The upholstery is from 10 to 12 inches deep and is made from leather. The top is a five-bow, one-man type with patented quick-adjustable curtains. On the cowl are found a Stewart-Warner speedometer, a gasoline gauge, and an electric indicator. All dials are electrically illuminated. The button for the electrically driven motor horn is mounted conveniently on the center of the steering post.

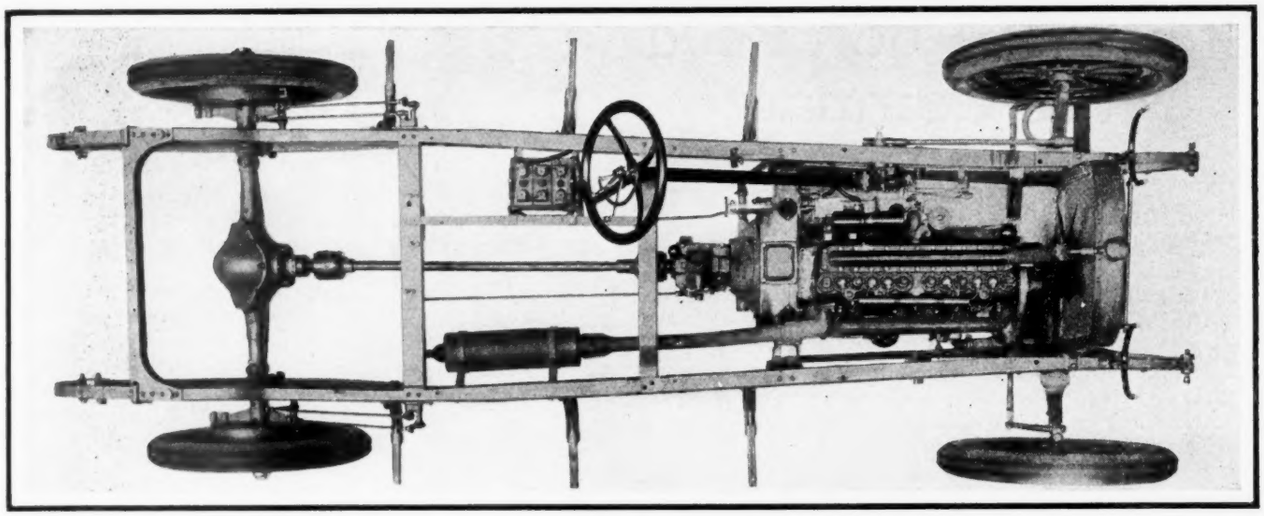
The motor is a Continental make, model 6-N. It is an L-head, block design with the valves on the right and fully inclosed. Also on this side are most of the motor auxiliaries. The shaft which drives the centrifugal water pump also operates the Atwater Kent Unisparker and the generator. The former is driven from the pump shaft by a bevel gear while the latter is directly connected. The four-bladed fan which aids in the circulation of the cooling air is driven by a sectional belt from a pulley attached to an extension from the front end of the pump shaft.

On the right side of the motor is the carbureter, and starting motor. The carbureter is mounted high and is very accessible. It is a Rayfield product, is fitted with a dash adjustment for starting and is water jacketed. The starting motor meshes with gear teeth cut in the flywheel rim. The oil breather and filler opening is located at the front on this side and there is also a gauge for determining the amount of oil in the crankcase.

Connection between motor and gearset is made through a multiple disk clutch which is housed in the flywheel which in turn is inclosed in a bell-shaped extension of the crankcase.



Two views of Enger motor. The upper one shows the right side and the mounting of the pump, sparker and generator, while the lower one shows the left side of the motor and the position of the carbureter, starting motor, breather and oil gauge



Plan view of Enger chassis, showing unit power plant suspended at three points, the position of the battery and the general arrangement of parts about the chassis

The gearset is bolted to this member. It is a three-speed sliding gear type. Gear changes are made through a lever which is mounted directly on the top of the case, which makes a very simple arrangement and is in accord with modern practice. Large inspection plates are provided in the clutch case, while the gears may be looked over by taking off the top cover which carries the shifting lever.

Power is transmitted to the rear axle through two universals. No torque or radius rods are used in the rear construction, the drive being taken through the springs, which are of the three-quarter elliptic type. The main leaves are constructed from vanadium steel and they measure 54 inches in length.

The rear axle is a floating type fitted with a diagonally placed differential cover plate so that the differential gears may be readily inspected or removed.

Two sets of brakes are employed. Both operate on the same rear wheel drums, one being contracting and the other expanding. They are faced with a special-treated friction material. Brake equalizers equally divide the force applied to each wheel.

The steering gear is mounted on the left. It is irreversible and is adjustable for wear. The wheel is of polished ebony and provision is made for easy lubrication of the gear.

Thirty-four by 4-inch tires are used all around, being fitted to Firestone demountable rims.

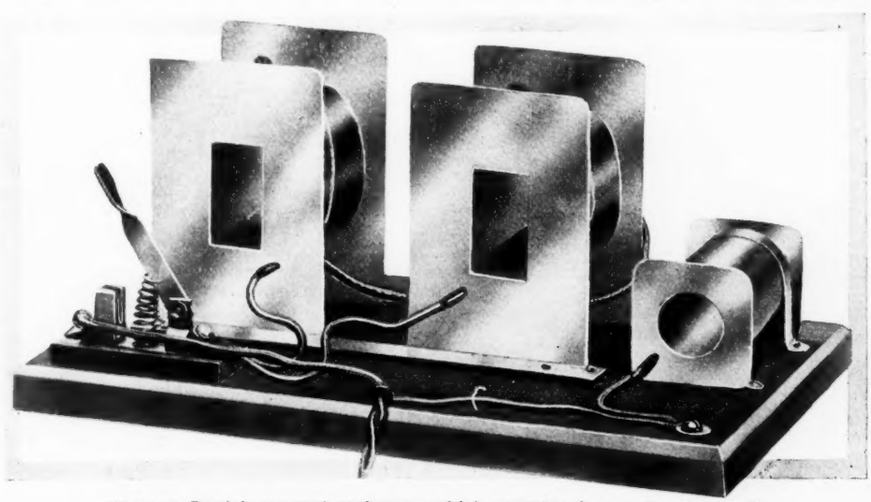
Metzger-Daniels Magnet Recharger Does Work in 6 Seconds

MAGNETO magnets may be charged in 6 seconds by means of a recharger manufacturer by the Metzger-Daniels Co., Portland, Ore. An ordinary 6-volt storage battery, or six dry cells in an emergency, may be used as the source of current. The device consists of two powerful electro-magnets compactly mounted on a suitable base, to which the binding posts and switch are fitted. When charging, a current of about 30 amperes is required, but the time during which it flows is so small that it does not injure the battery in any way, it is stated. In operating the instrument the switch is opened and closed intermittently, it being closed for about 2 seconds at a time.

To locate the correct charging position in relation to the polarity, the operator merely holds the magnet to be charged close to the rectangular openings in the coils, and makes a short contact at the switch. If the charging position is correct the magnet will be attracted by the coils, but if the charging position is not correct the magnet will be repelled. After locating the correct charging position the magnet is inserted in the coils so the ends of the magnet protrude through the coils. A piece of iron or steel is now placed across the ends of the magnet, and three contacts of the switch for about 2 seconds each will fully charge the magnet. The magnet may now be placed back on the magneto in the original position.

As the retentive qualities are dependent on the hardness and grain of the magnet it is difficult to establish a standard charge for any make of magnets, due to the varying quality.

The Metzger-Daniels magnet charger is guaranteed for a period of 5 years from date of sale, and the list price is $25.



Metzger-Daniels magnet recharger which operates from a 6-volt circuit

Stewart Fuel Feed More Compact

Valve Mechanism Completely Housed Within Cylindrical Tank—One Atmospheric Vent

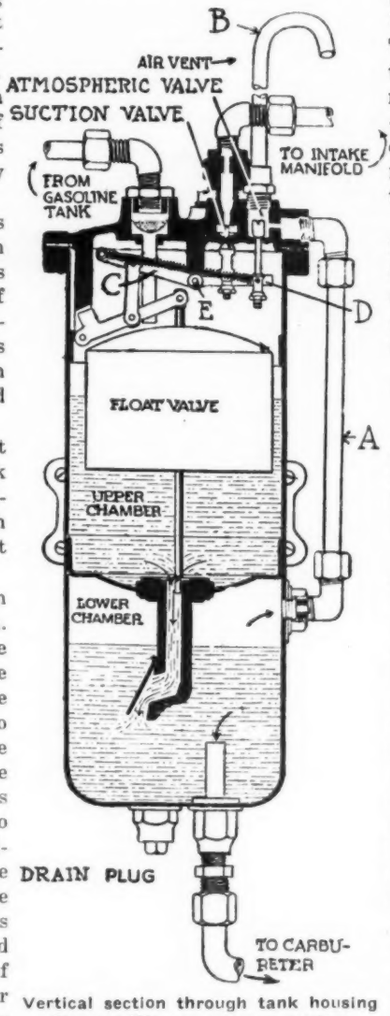
SEVERAL detail changes have been made in the Stewart Vacuum Gasoline system since it was described in the April 2, 1914 issue of THE AUTOMOBILE. The principle has not been altered but the design has been made more compact and simple. The valve mechanism is now contained entirely within the cylindrical housing while formerly it was located in an offset at one side. There is now but one atmospheric vent, while formerly there were two. These and other slight changes make a description of the device, as it now is, of interest, especially since the system has been made standard equipment on many 1915 cars.

In this system the suction of the motor is employed to draw gasoline from the main fuel tank to the carbureter, and with its use the tank can be located at the rear of the car the same as with the pressure system. It is claimed that all the advantages of the pressure system are obtained with very little more complication than is found on the ordinary gravity feed.

In common with the pressure system it has the advantage of the gasoline tank hung at the rear, yet it avoids the complication of the former by doing away with all pumps, gauges and reducing valves. Not even an air-tight tank is needed.

The actual construction of the mechanism is shown by the accompanying illustration. This mechanism is all contained in the cylindrical tank shown, which may be mounted on the front of the dash or on the motor as desired. The tank is divided into two chambers, the upper one being the filling chamber and the lower one the emptying chamber. The former contains the float valve and the pipes running to the gasoline tank and to the intake manifold. The lower chamber is called the emptying chamber and from it runs the pipe to the carbureter. This chamber is under atmospheric pressure at all times and the flow of fuel from it is by means of gravity only. However, since this chamber is located somewhat above the carbureter there is always a free flow of gasoline. Atmospheric pressure is maintained by means of the pipes A and B, the latter opening into the atmosphere.

Referring to the accompanying illustration it will be seen that in order that fuel may be sucked from the main tank to the upper chamber the suction valve must be open and the atmospheric valve closed, the float then being at the bottom. Under these conditions the suction at the intake manifold draws the gasoline from the main tank to the upper chamber. When the upper chamber is filled, the float rises to the top, closing the suction valve and opening the atmospheric valve. Thus the suction is cut off and the lower chamber is now filled by gravity, there being atmospheric pressure in both chambers now. The flap valve between the two chambers is to prevent the gasoline in the lower chamber from being sucked back into the upper one.



Vertical section through tank housing Stewart-Warner vacuum system

The float is designed to be intermittent in its operation. When the level of gasoline drops to a certain point, the float falls, the suction valve opens and the atmospheric valve closes. The suction of the motor then causes a flow of fuel from the gasoline tank. Then, when the level rises to a predetermined height, the float returns to its upper position. It takes about 2 seconds for the chamber to become full enough to raise the float—.05 gallon being transferred.

The atmospheric and suction valves are controlled by the two levers, C and D, both of which are pivoted at E, their outer ends being connected by two coil springs, only one of which is shown in the illustration. It is seen that the arrangement of these two springs is such that the float must be held at the extremity of its movement. It cannot assume an intermediate position. This intermittent action is required in order that the upper chamber may be under atmospheric pressure part of the time in order for all gasoline to flow to the lower chamber. It will be noted that the movement of the float mechanism is so large that no adjustment is needed on the valves.

The pipe running from the bottom of the lower chamber to the carbureter extends up into the chamber, so that there is little chance of dirt or water being carried to the carbureter. A drain plug is provided to the left of this pipe for cleaning out dirt.

Few Parts to Wear

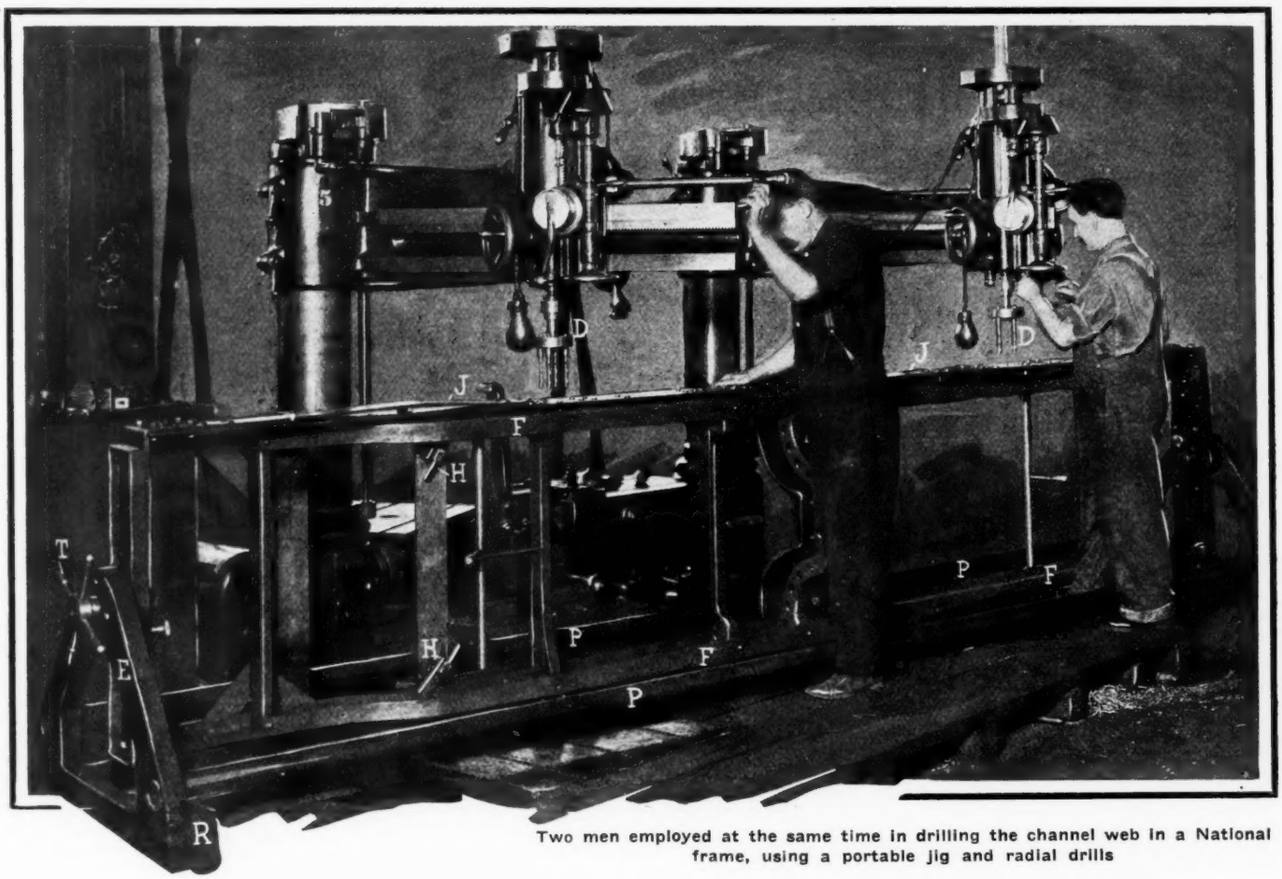
Great durability is claimed for this device because there are few parts to wear. The springs are made out of No. 28 gauge bronze and have a stretch of only .125 inch, so they should last a lifetime.

The only time that the vacuum can become so low that it will not draw gasoline from the rear tank is when the tank pressure is below 4 ounces, and this condition can exist only when the motor is running below 600 revolutions per minute with wide open throttle. In actual practice a car is never operated under these conditions long enough to exhaust the supply of fuel in the tank. Running with open throttle below a speed of 600 revolutions per minute means that the motor must be laboring up a hill, and as this is detrimental to the motor the Stewart-Warner system acts as a safeguard.

If the car is allowed to stand long enough so that the tank becomes empty it will be replenished after the motor has been cranked over four or five times with the throttle closed.

The installation of the Stewart-Warner vacuum-gravity system is very simple and can be accomplished in a short time without the use of any special tools. The suction pipe is tapped into the manifold at a point as near to the cylinders as possible, while the fuel pipe is inserted into the gasoline tank and runs to the bottom. There is a screen at the end of the fuel pipe to prevent any trouble due to sediment. Since the fuel is sucked from the gasoline tank, the filler cap need not be air-tight but on the contrary should be provided with a small vent so that the pressure in the tank will be at atmosphere.

It is manufactured by the Stewart-Warner Speedometer Corp., Chicago, Ill.



Two men employed at the same time in drilling the channel web in a National frame, using a portable jig and radial drills

Portable Jig Aids in Drilling National Frames

Clamping Frame in Jig and Rolling It Under Two Radial Drills Saves 50 Per Cent. in Time

FRAME drilling in the National plant at Indianapolis is accomplished by an ingenious jig. Instead of having to resort to the setting up of multiple spindle drills for each different series of jobs to be done on the frame, it is merely clamped in the jig and rolled under a pair of radial drills as shown in the accompanying illustrations. The drills are made up in sets and setting up is accomplished in minimum time.

Referring to the illustrations, the frame F is clamped in the jig J by means of the dogs H. The jig is composed of two end castings E, and large tubular connecting members P. Inside this framework the jig is free to swing on a pivot support at its center. The jig can be held in any desired position by turning the hand nuts T. The radial drills D, are all made up in sets and the workmen merely have to clamp them in the chuck.

In order that the work will be as convenient as possible there is a platform for the men to stand upon and the end pieces for the jig have been so constructed that the rollers lift the jig above the platform and it can be rolled into position without interference.

Two men can work at the same time on the frame, one handling one of the radial drills and the other handling that on the other end of the frame. When the two are through their work, the frame is simply turned over by loosening the hand nuts. The drills are then all set up for work on the other side. The frame is put in the jig to one side of the drills where there is a clear floor space for the purpose. It is quickly slipped in place in a horizontal position and the dogs clamp it in the proper position. The jig is then turned up on edge to bring the frame in proper position for the work and the entire outfit is rolled under the drills. It is estimated that a cut of at least 50 per cent. in the required time for frame drilling has been effected by this system.

National frame in jig placed beneath the radial drills. When one side is drilled the jig can be rotated with the frame

New Books for the Engineer

A WEALTH of motor literature is submitted by British publishers. Most complete of these, from an engineering standpoint is A Manual of Petrol Motors and Motor Cars by F. Strickland, Charles Griffin & Co., publishers. Others take up Motor Traction, Petroleum Storage and several subjects pertinent to motor car manufacture. *The Autocar*, through Iliffe & Co., has published some interesting and instructive handbooks on motor car troubles.

A MANUAL OF PETROL MOTORS AND MOTOR CARS. By F. Strickland. Second Edition. Charles Griffin & Co., Ltd., Exeter street, Strand, London. Cloth; 378 pages; 352 illustrations; 18 shillings.

This book sets forth clearly and concisely everything concerning a motor engine from its history to calculations of curves of inertia, and pressure and differential gear stresses. All matter is, however, so simply conveyed that it would make itself clear to the most veritable novitate. Effort has been made to show the amount of power necessary for cars of given weight, with figures, as to engine stress.

MOTOR TRACTION FOR BUSINESS PURPOSES. L. M. Meyrick Jones, A.M.I., Mech. Eng.; and Horace Wyatt, B.A., from data collected by the editorial staff of *Motor Traction*. Iliffe & Sons, London, publishers.

This book is a guide to the selection, cost of running and maintenance of commercial and public service motor vehicles. In it are taken up the general conditions governing the adoption of motor haulage, legal restrictions and the working costs of almost every form of motor tractor.

All data has evidently been carefully compiled and thoroughly considered. This book should prove itself valuable to anyone contemplating the purchase of motor vehicles.

A PRIMER ON THE STORAGE OF PETROLEUM SPIRIT AND CARBIDE OF CALCIUM. By Major A. Cooper-Key, Chief Inspector of Explosives and Member of the Council of the Institute of Petroleum Technologists. Charles Griffin & Co., Ltd., London, publishers. Price 2 shillings 6 pence.

Devoted to a consideration of the best means of effectively administering the Petroleum Acts. Taking up from the viewpoint of the inspector of explosives, the things which are necessary for keeping within the law in handling petroleum and calcium carbide. Points are given on proper licensing, together with possible future legislation.

HYDRAULICS. By W. M. Wallace, Wh. Sc., A.R.C., Sc. A.M., I.C.E., The Technical Publishing Co., London, W. C.

For engineering students and engineers in practice. Including recent research and invention in hydraulics. The first part of each chapter, deals with the main principles in easy language, leaving the more mathematical demonstrations to the second part, examples at the end of each chapter being graduated similarly. As far as possible the author has avoided using the hydraulics as a peg on which to hang essentially mathematical demonstrations which lead to results, the truth of which, more often than not depends on somewhat arbitrary assumptions.

SMALL ACCUMULATORS. By Percival Marshall, A.I. Mech.E. Spon & Chamberlain, publishers, 123 Liberty street, New York City.

A scientific hand-book for students and engineers, published in answer to the questions sent the author as Editor of *The Model Engineer and The Amateur Electrician*. Setting forth the making of storage batteries and cells, methods of charging and governing.

COMPLETE HINTS AND TIPS FOR AUTOMOBILISTS. From *The Autocar*. Iliffe & Co., London, publishers. Fifth Edition. Price 2 shillings 6 pence, net.

Compiled from the many inquiries, and the answers they have elicited in *The Autocar*, of London., since 1902. The booklet contains an index, giving immediate access to the explanation of the best means of overcoming motor-car difficulties.

FAULTS AND HOW TO FIND THEM. Iliffe & Sons, London. Edited by J. S. V. Bickford, B.A. Price 2 shillings 6 pence.

Containing a list of 180 faults in motor cars and their remedies. This book covers about everything that could happen to an automobilist in the course of his travels.

THE MOTOR MANUAL. The Temple Press, London, publishers. Price 1 shilling 6 pence.

A simple description, fitted for amateurs, of the working parts of cars together with remedies for faults which may crop out. Every part of the motor is described carefully. Much space is devoted to explanations of motor starters and electric lighting. Concise information is given of all recent developments.

Many new hints are also given in repairs and adjustments.

The fuel question is taken up quite exhaustively, with several pages devoted to benzole, which is taken as the only practical substitute for gasoline.

THE MAINTENANCE OF MOTOR CARS. By Eric W. Walford. Iliffe & Sons, publishers. Price 2 shillings 6 pence.

For the large number of owners who have had little or no motor car experience. Descriptions are for this reason, made as clear as possible, the assumption being made that the reader has not much technical knowledge, also removing many of the bogies that haunt prospective buyers of automobiles.

PUNCHES, DIES AND TOOLS, FOR MANUFACTURING IN PRESSES. By Joseph V. Woodworth, the Norman W. Henley Publishing Co., 132 Nassau street, New York City. Cloth, 500 pages, 702 illustrations, $4.

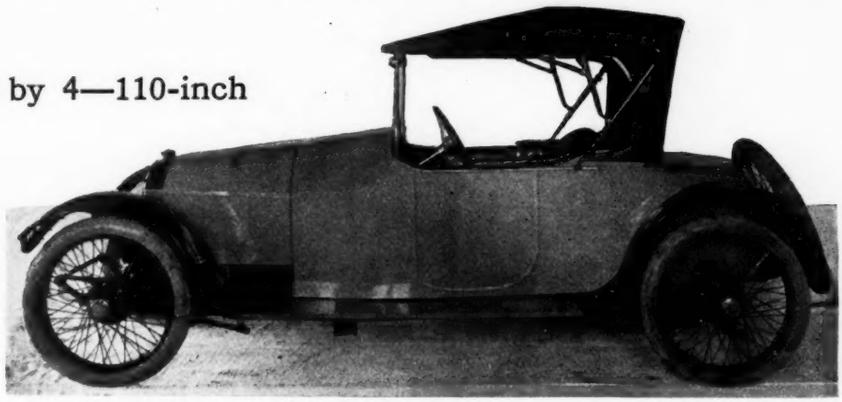
This work is a companion volume to the author's elementary work entitled Dies, Their Construction and Use. It does not go into the details of die making to the extent of the author's previous book, but gives a comprehensive review of the field of operations carried on by presses. It might well be termed an encyclopedia of die making, punch making, die sinking, sheet metal working, and making of special tools, subpresses, devices and mechanical combinations for punching, cutting, bending, forming, piercing, drawing, compressing and assembling sheet metal parts and also articles of other materials in machine tools.

DIES, THEIR CONSTRUCTION AND USE FOR THE MODERN WORKING OF SHEET METAL. By Joseph V. Woodworth, the Norman W. Henley Publishing Co., 132 Nassau street, New York City. Cloth, 384 pages, liberally illustrated, $3.

A most useful book, and one which should be in the hands of all engaged in the press working of metals, treating on the designing, constructing and use of tools, fixtures and devices, together with the manner in which they should be used in the power press, for the cheap and rapid production of the great variety of sheet metal articles now in use, It is designed as a guide to the production of sheet metal parts at the minimum of cost with the maximum of output. The hardening and tempering of press tools and the classes of work which may be produced to the best advantage by the use of dies in the power press are fully treated. Its 505 illustrations show dies, press fixtures and sheet metal working devices, the descriptions of which are so clear and practical that all metal-working mechanics will be able to understand how to design, construct and use them. Many of the dies and press fixtures treated were either constructed by the author or under his supervision. Others were built by skillful mechanics and are in use in large sheet metal establishments and mechanic shops.

Luxury at $775 in New Scripps-Booth

Four-Cylinder Motor 2 7-8 by 4—110-inch Wheelbase—Electric Door Openers—Electric Starting and Lighting—Wire Wheels—Three Body Types

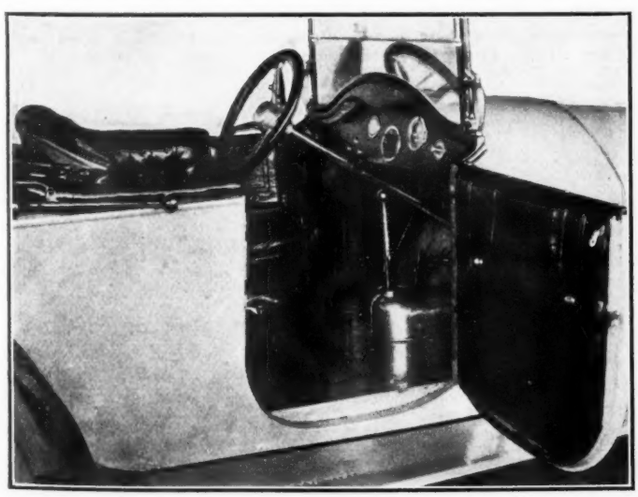


Side view of new streamline Scripps-Booth light car which sells at $775 with complete equipment including electric lighting and starting and wire wheels. The frame is oversiung instead of undersiung as shown in the illustration

THE new Scripps-Booth car to succeed the cyclecar which this concern brought out a year ago, is one of the most luxurious types of automobiles in its class, which has been brought out. Fitted with a four-cylinder motor 2 7-8 by 4 inches bore and stroke, with 110-inch wheelbase, with 30 by 3 1-2-inch tires, and with such up-to-date equipment as motor-generator for engine cranking and lighting, Houk wire wheels, electro-magnetically controlled doors, electric horn, 9-inch upholstery in the seats, and many other details, show how the Scripps-Booth Co., Detroit, Mich., has endeavored to produce a car with all luxuries at $775 as a roadster. This price includes equipment, such as an extra wire wheel with tire, silk mohair top, rain-vision windshield, side curtains, and Klaxet electric horn.

The new Scripps-Booth is made with an option of three treads, 40, 56, or 60 inches. In addition to the four-cylinder motor with an S. A. E. rating of 13.25 horsepower, but claimed to show 19 in actual performance, the car makeup includes cone clutch, three-speed gearset, shaft drive, and double set of rear wheel brakes. The chassis frame is overslung in front on semi-elliptic springs. In the rear cantilever springs, giving a 7-inch radius of action, are employed.

It is in connection with the bodies that the luxury of the Scripps-Booth appears. It is made in three body styles, namely, roadster, cabriolet, and coupé, all with three passenger capacity. The roadster sells at $775. This body has come under the hands of a clever designer for it is exceedingly attractive. It is a streamline type with a decided slope to the bonnet. The effect is carried out by a V-shaped radiator of German silver, and by continuing the bonnet slope back to the end of the cowl. The rear is given the torpedo shape, and this is attractively set off by the mounting of a spare wire wheel on the deck.



Control features of new Scripps-Booth, showing left drive and center gearshift as well as arrangement of instrument board

Seating is well worked out. The drive seat is placed slightly forward of the passenger seat which gives a modified staggard arrangement, and ahead of this there is mounted an auxiliary folding seat to accommodate a third person. Deep Turkish upholstery of long-grain buffed leather, unusual in a car of this type and price, and having a depth of 9 inches is used.

Electric Door Opener

One entirely new feature is the use of electric door latches, eliminating entirely door handles of any form. A push button, placed close to the door in the side of the body, operates the latch magnetically. Domed fenders do their part in making the machine attractive, and with wide doors and clear running boards the body meets every requirement of the most fastidious. The door width, to be exact, is 21 inches.

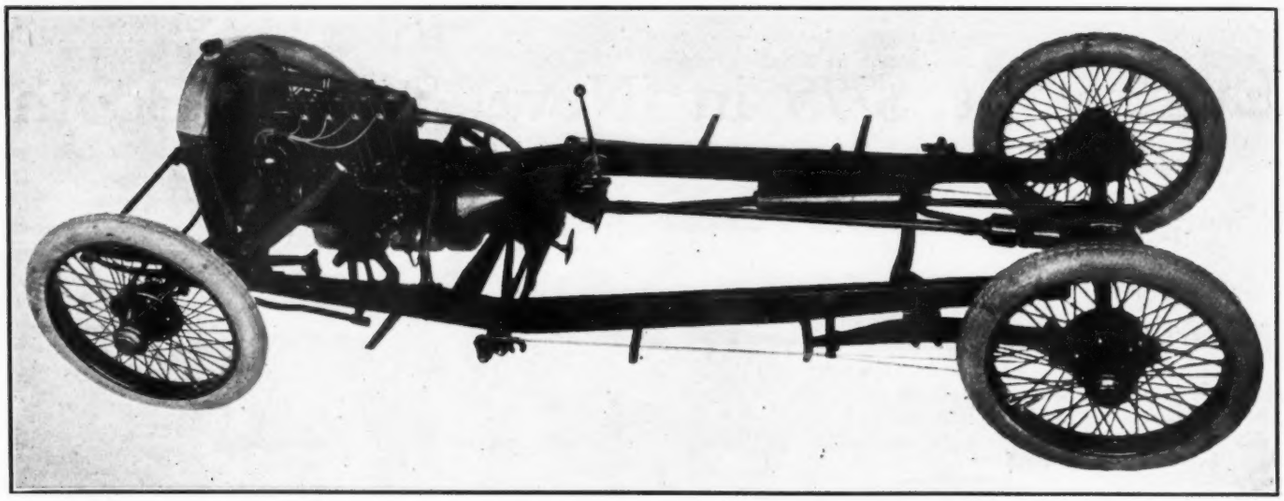
The drive is on the left, a 16-inch walnut steering wheel being used. On this, there is a throttle lever swinging vertically, and an unusually large push button operates the Klaxet horn. This is a domed aluminum affair placed at the center of the steering wheel spider and having a 3-inch diameter to make horn signalling as easy as possible.

On the cowl board are arranged the sight feed oiler, the starting strangler on the carbureter, ignition switches, ammeter, and flush-type speedometer. A dash light in the center illuminates these. Back of the cowl board is the gasoline tank with filler protruding through the board.

Three-Point Suspension

The power plant is of the unit type with gearbox bolting to the rear of the flywheel housing. This assembly is supported in the frame by arched cross members, from which it is hung by bolts, there being two points of attachment to the rear cross piece and one to the front, giving the well-known three-point suspension.

The motor is really a high-speed type and is made by



Scripps-Booth chassis, showing tapered frame, cantilever rear springs and mounting of the four-cylinder unit power plant

Sterling. It attains speeds as high as 2,750 revolutions per minute without appreciable drop in the power curve.

Silent operation has been well attained by the special design of the cams which allow the valves to drop to within 1-1000-inch of their seats and then slowly lets them down the remaining minute distance. These valves have a clear opening of 1 1-8 inches.

The general arrangement of the cylinder block is of the form in which the crankcase and the cylinders are cast in one piece, the head carrying valves and passages to the intake ports being detachable. Rods run up from the camshaft to the rockers overhead operating the valves, and are very silent in action. The exhaust manifold is a separate piece and bolts to the cylinder head. Access to the main bearings is possible through the large plate at the bottom of the crankcase. The crankshaft is carried on two main bearings, and the camshaft has three.

The oiling is of the circulating splash type with a small pump supplying a constant level of lubricant to the individual troughs under each connecting rod. Provision is made for assuring a constant trough level despite the angle of the motor.

Thermo-syphon cooling is used and the radiator is a cellular type of large capacity.

Ignition has no connection with the motor-generator for cranking and lighting, except that the distributer receives its current from the same battery as is used for the balance of the electric functions. The distributer is an Atwater Kent with automatic advance, there being no hand control.

Motor-Generator System

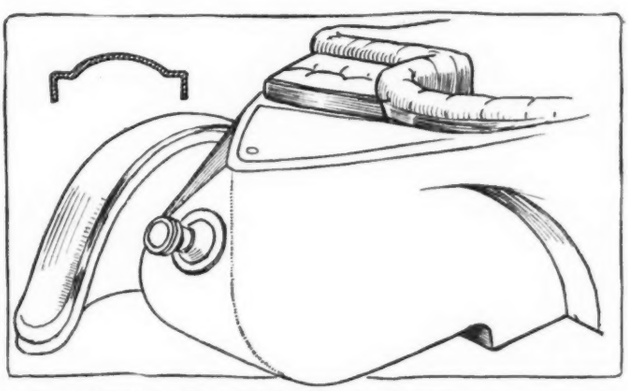
Hung from an integral bracket on the right side of the crankcase is the combined motor-generator which operates either as an electric motor for cranking or as a generator for supplying lighting current and charging the storage battery. This electric unit is driven through silent chain connection direct to the crankshaft. A sprocket placed just ahead of the flywheel on the extension of the crankshaft accommodates this chain. On test, this starting motor has spun the engine at 265 revolutions a minute for 12 minutes at a temperature of 60 degrees.

The headlights are of the two-bulb type, the small bulbs dimming the lamps for city work. The storage battery is conveniently located in a compartment just back of the driver's seat in the roadster.

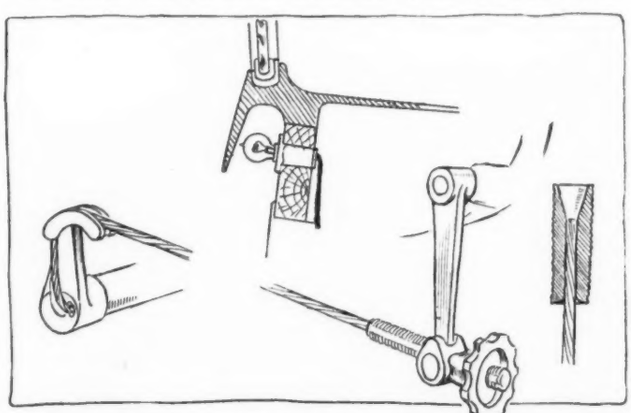
Cone Clutch Used

The clutch is a leather-faced cone and back of it is the three-speed selective gearset. Unusually large gears are employed of the substantial stub-tooth variety. These gears have a face width of 5-8-inch, and are constructed of 3.5 per cent. nickel steel. The control lever, of the ball-and-socket type, is mounted at the rear of the gearbox and gives center control.

A 1 1-4-inch tubular drive shaft, uninclosed, conveys the power to the rear axle. Though light in weight, this shaft is strong and proof against whipping due to its tubular section. Both front and rear ends of the shaft are fitted with a new type of universal joint, manufactured by the Universal Products Co. These are of ball type and allow for end play of the shaft due to the varying position of the rear axle with respect to the chassis.



Rear construction of Scripps-Booth with bracket for carrying spare wire wheel. At upper left is shown a cross section of the fenders



Above is shown the electric lamp on the instrument board so arranged as to shield the passengers while throwing the light on the instruments. Below is shown the novel brake adjustment

The drive is taken through the springs, while a triangular torque arm of tubular construction takes the torque. This arm hinges to the rear axle housing, and has a spring buffeted attachment at its front end to a frame cross-member placed only a short distance forward of the rear axle. The result of this construction is that the torsion member is exceedingly short, and therefore light in weight.

The rear axle, which is a specially designed type, is of floating construction. Very large gears are used, these being of six pitch and having 1 1-4-inch face. The pinion is one piece with the pinion shaft, while the whole mechanism is carried on annular ball bearings. Three and a half per cent. nickel steel is used in making the gears.

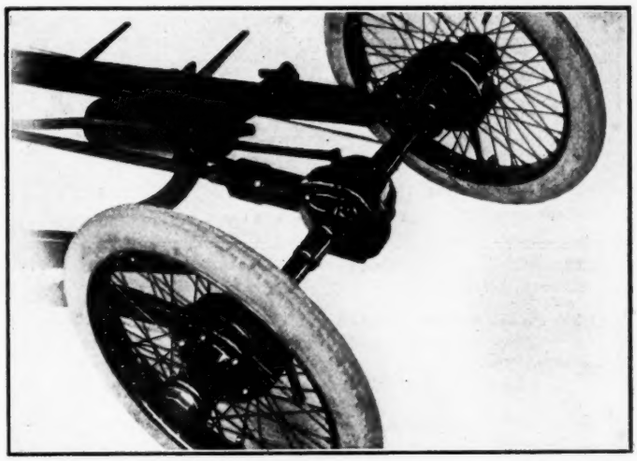
New Frame Shape

In order to give a substantial support to the body, which slopes to both front and rear, the frame is of unusual shape, having a taper forward as well as to the rear. The widest part is a little forward of the center of length where the body is widest. This is about at the cowl. The pressed steel channels have a 4-inch depth of section and are well braced.

The chassis is underslung due to the use of semi-elliptic front springs carried over the tubular front axle, and cantilever rear springs. The latter are 32 inches long and have a 7-inch vertical action. Due to the small amount of unsprung weight, the car is very comfortable to ride in.

Pedals for Brakes

The braking system is unusual in several respects. Though both service and emergency sets operate on rear wheel drums, they are both controlled by pedals instead of the emergency set working through hand lever. The clutch pedal operates the service set as well as the clutch, while the emergency pair are brought into action by the pedal to the right of the clutch pedal. This latter is fitted with a ratchet to hold the brakes. Steel cables run from the equalizers back to the brake drums, and adjustment is made very easy through the use of small hand adjusting wheels at the drums. These steel cables not only are a factor for lightness, but they are obviously free from rattle. They have very often been used on racing cars.



Rear construction of the Scripps-Booth showing the cantilever spring supporting the rear ends of frame, mounting of muffler, etc.

Des Moines Garage Adds to Appearance of Residential Section

THE Brown Garage, operated by the Brown Garage Co., Des Moines, Ia., which was recently opened by a show, and a convention of the automobile men of that city, has many unusual features. The garage, which is two stories in height, is built of light brown stone. The front is made attractive by potted plants and flowers placed in all the windows, making the garage, although in a residential district, a decided addition to the appearance of the section.

Interior improvements are many. Each car stall, which is 8 feet square, is equipped with air, water, electric light and a ventilator. An outside runway leads from the street to the second floor, thereby making unnecessary the use of an elevator, with its attendant delay and possibility of accident.

Three oil tanks with a capacity of two barrels each, are located in the rear of the building. Nine oil pumps are located in the basement and two upper floors. There is also a large gasoline pump at the curb. Air and water taps are also mounted in two boxes at the curb at each end of the building.

Brown Garage in Des Moines, Ia., which is rendered attractive by means which unfortunately are unsual in garage construction

The garage is constructed of steel and concrete throughout, and is absolutely fireproof. The entire rear of the building is of steel and glass, giving it plenty of light. The front doors are opened and closed by electricity.

Industrial Welfare Conference November 17-19

HARRISBURG, PA., Nov. 2—A call for second conference of the Pennsylvania Industrial Welfare and Efficiency Conference has been made. This will be held in the State Capitol, this city, on November 17, 18 and 19. This conference is held under the auspices of the Pennsylvania Dept. of Labor and Industry and the Engineers' Society of Pennsylvania. The purpose of the conference is to enable the employers and employes to work out together the problems before them with reference to increasing the welfare of the employes and the prosperity of the industries.

Careless Iowa Motorists Warned

DES MOINES, IA., Nov. 2—The Iowa State Highway Commission has issued a bulletin showing that sixteen Iowa people were killed at railroad crossings in the state during August; that three lost their lives as the result of reckless speeding on country highways; that two were killed as the result of narrow grades and bridges. The commission warns Iowa people against reckless driving and against careless approaches to railroad crossings. Six of the nine accidents at railroad crossings were due to trains striking automobiles. Five deaths were due to trains striking horse-drawn vehicles.

NEW YORK CITY, Nov. 2—Deliveries on the Singer Six have commenced by the Singer Motor Co., Inc.

The Automobile

PUBLISHED WEEKLY

Vol. XXXI Thursday, November 5, 1914 No. 19

THE CLASS JOURNAL COMPANY
Horace M. Swetland, President
W. I. Ralph, Vice-President E. M. Corey, Treasurer
231-241 West 39th Street, New York City

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Other Countries in Postal Union, including Canada --------- One Year, 5.00
To Subscribers—Do not send money by ordinary mail. Remit by Draft, Post-Office or Express Money Order, or Register your letter.

Entered at New York, N. Y., as second-class matter.
Member of the Audit Bureau of Circulations.
The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly) May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907.

Fewer Roadsters

THE policy of several makers of gasoline cars not including roadster bodies for next season, suggests the thought that for touring the four or five-passenger car is really the more comfortable, and comfort must never be lost sight of when making a tour. The roadster offers a most attractive vehicle for fine weather and general service but is not so inviting for long-distance work where baggage must be carried as well as passengers.

At first thought it seems bad business not to meet the demand for single-seated cars, but several good reasons for this policy can be found. In the first place, there is only a small patronage for the roadster body type as compared with the sales of five-passenger designs. In nearly every case where roadsters are offered, they go on the same chassis as a touring car, and therefore a machine carrying the former body is really designed for a slightly heavier one, and can carry it just as well.

So far as the mechanism is concerned, so far as fuel and oil consumption and tire wear are to be considered, it costs nearly as much to operate one as the other. One can make as much speed as the other for all practical purposes, and the business man is beginning to think it just as well to be able to carry three extra persons when he wants to as to be limited to only one besides himself.

Looked at from the manufacturing standpoint, the concentration upon one body model is desirable for it is less expensive to make a certain number of one type than to equal that number with more than one.

In the low-priced field, where the dollars count most to the buyer, he will recognize the advantage of the two-seated car more and more, and the result will soon be that only the higher-price car makers will be offering roadsters, for their trade can afford to waste power.

Touring in Electrics

IT still remains a most disputed problem as to whether the electric vehicle should be looked to to play any part in long-distance touring or not. On one side are ranged those who believe that the electric in its present status is not well suited for such work. On the side opposite are those who think otherwise. In general manufacturers do not believe that the present electric should be used for country touring on the ground that it has rather been designed for city use.

From the standpoint of arbitrary mileage there are many sections in the East where charging stations are close enough together to admit of using the electric for much country work. In these sections at present the electric is not generally used for this work, largely because those who do the touring are often undecided as to the exact distance they want to make, and distance is the great criterion of the success of the electric for touring.

The electric today is so dependable a vehicle that it can successfully be used in trips between cities where the distance is less than the battery mileage. In this capacity it acts as a substitute for the suburban trolley or the steam train.

But touring in the accepted sense goes further. Touring today has a more comprehensive meaning than it had 5 years ago. Today touring is getting more and more off the beaten path. It is not so much mileage as the desire to reach places that have hitherto been looked upon as inaccessible. In this sense it means getting away from those sections where the charging station is found and naturally the electric suffers in this respect.

But there is another side to the question, namely, that touring today does not mean mileage solely as it used to years ago. Today there is more thought of comfort, and having an opportunity to see the country, rather than endeavoring to make as many miles as possible. In this respect the electric is more favored than it was some years ago.

Before the electric reaches the stage of being taken seriously as a vehicle for country touring it will have to be more adapted to the needs of touring. The lighter open body will take the place of the palatial closed types of today, which are so well suited for city uses. The lighter body will add to mileage possibilities and will also give the tourists an opportunity of seeing the country, which still remains a valuable factor in touring. The field of inter-city work for electrics can also be cultivated.

Should Test Motors on Spring Chassis

Metropolitan S. A. E. Hears That Mounting of Motors on Rigid Test Blocks Is Wrong—Prof. Riedler's Work

NEW YORK CITY, Oct. 29—At the regular monthly meeting of the Metropolitan Section of the Society of Automobile Engineers which was held at the Automobile Club of America to-night, Professor Marshall discussed the work of Dr. A. Riedler in the laboratory for motor cars at the Royal Technical University, Charlottenburg, as recorded in Dr. Riedler's book, "The Scientific Determination of the Merits of Automobiles."

The book, which is published in English by the General Oil Publishing Co., Ltd., 6 Broad Street Place, London, E. C., contains 333 pages and 227 illustrations. The reports on tests of motor cars include all types from those of a military transport wagon running 10 miles per hour up to a 100-horsepower racing car with a speed of 90 miles per hour.

While the report is supposed to be unbiased, deductions have been drawn which are most favorable to German-made cars and motors. Further, the German cars were in perfect adjustment and were of modern construction, which was not always the case with the foreign cars.

The book is divided into ten reports: 1—To explain the test stand used and the methods of testing; 2—the investigation of a 30-horsepower Renault car; 3—test of a 100-horsepower Benz racing car and comparison of the Benz and Renault; 4—test of a 75-horsepower Adler racing car; 5—Mercedes electromobile; 6—35-horsepower Bussing military transport wagon; 7—test of the motor for the above wagon; 8—slide valve motors, method of test—comparison with poppet valve motors; 9—test of a 40-horsepower English Daimler-Knight car; 10—conclusion of reports 1-9.

In all these reports Dr. Riedler has used diagrams freely, the most common being those showing the energy, running, gradient and power losses in the various parts of the car.

Other diagrams are the acceleration, specific power, efficiency, opening of suction pipe and ports of Daimler-Knight.

There are several half-tone cuts of complete cars and of motors; also many line drawings of chassis and details of motors which were tested.

The testing apparatus was of the drum type with dynamo brakes. The rear wheels of the car were supported on these drums, the front wheels were placed on small plates resting on roller bearings, and the car was prevented from moving forward by means of a cable attached to the rear, which was also used in connection with the measurement of the draw bar pull.

The conclusions drawn were as follows: The correct investigation of power vehicles assumes accurate measurements corresponding to the actual working of the motor and car. In these tests accuracy was made doubly sure in most cases by two methods of measuring entirely independent of each other. The mounting of motors on rigid test blocks is wrong. They should be on spring chassis. The testing requires trained and clever attendants and not a staff kept by makers of cars for running in motors. It is a mistake to use car test stands as a substitute for the running in of cars. Not much has been done to increase the thermal efficiency of motors. The small amount of gearbox losses shows the futility of efforts to improve the driving members of cars. The power curves of the Benz and Adler motors show that the motor power increases almost directly with the speed. Economic operation of motor cars and trucks especially shows that economy is inseparably bound up with low traveling speed. In the interest of road maintenance only rubber tires should be used. The resistance of iron tires is large. Springing in the drive is of great value for working of the motor clutch. At low speeds, the flywheel greatly influences the acceleration and retardation conditions.

Much Valuable Data

Professor Marshall goes on to conclude that Dr. Riedler's reports contain much of value to the engineer regarding the various losses in the transmission of power in the various types of automobiles. There is nothing new in his method of testing cars on brake drums by means of electric motors connected to these drums.

By omitting many details which he terms secondary in order to arrive at conclusions of his own the reader is compelled to accept the results and conclusions arrived at, for there are no records given to examine to check the results obtained.

No indicator cards or valve settings are given, and neither is the method of measuring the gasoline consumed. No exhaust gas analyses have been reported. There is no conclusion or formula for the comparison of the performance of different cars in terms of gasoline used, transmission and gear ratios, wheel dimensions and car resistance.

Road tests were not made to determine the air resistance, but this was calculated from an assumed area. There is no statement as to the resistance of the air on the wheels when moving at speeds on the test bench corresponding to actual speeds on the road. The accelerometer which has proved its worth in road testing is not even mentioned, and thus Dr. Riedler failed to avail himself of one of the most valuable instruments for testing work.

Dr. Riedler compares the test results of two cars of widely varying types, a Renault touring car of 1905 with a high-powered racing car of modern construction, a Benz of 1910. Naturally the latter gave a better performance.

The effect of using different makes of tires is not touched upon nor is mention made of the condition of the tires, points of importance in discussing tire losses.

No account of carbureter efficiency or the effect of proper mixture is given.

Poor results were obtained in testing the Daimler-Knight motor, because the valves were improperly set, giving low power at high speeds; the carbureter was too small for the motor and lubrication was defective. For these reasons Dr. Riedler failed to obtain within 50 per cent. of the maximum horsepower possible with this motor as determined by Professor Morgan at the University of Bristol.

Some Criticisms Made

In the discussion Professor Riley of the Massachusetts Institute of Technology stated that in his opinion the tests were disorderly and that many mistakes had been made in translation. He also said that the proper basis of comparison for different types of motors was the mean effective pressure per square inch of piston area. He stated that good four-cycle designs of both the Knight and poppet type had given pressures as high as 110 pounds per square inch. He gave the following formula for calculating these pressures:

$$\text{Effective pressure} = \frac{\text{B. H. P.} \times 1008000}{D^2 \times S \times N \times P}$$

where D = bore, S = stroke in inches, R = the revolutions per minute and N = the number of cylinders.

He also said that if the specific pressure as calculated by this formula dropped below 70 pounds the valves were not properly set, and for high speed this figure should be at least 85. In the White and Poppe, for example, in 1,700 tests the pressure varied from 85 to 109 pounds.

Herbert Chase was of the opinion that for comparative purposes it was better not to drive through the tires because tires offer varying resistance, depending on the make and also upon the weight of fabric and the thickness of the tread. The amount of power that different tires will absorb will vary as much as 100 per cent.

Owen Thomas stated that the horsepower developed by the Daimler when tested by Professor Morgan at Bristol was 61.3, while the same model tested by Riedler showed an output of 41.3 horsepower. In the one case the horsepower per litre of cylinder volume was 16.3 and in the other 11.1.

Some of those present were of the opinion that laboratory testing was so different from actual road work that the results were not worth the expense, but Arthur B. Brown and Professor Lockwood of the Sheffield Scientific School stated that in the testing laboratory at Yale the tests in the laboratory agreed very closely with these on the road, and that the laboratory tests were of great advanage because of the possibility for accurate measurement.

At the next meeting of the section, which will be held on Tuesday, November 24, D. McCall White of the Cadillac company and designer of its eight-cylinder motor will discuss this type of engine.

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AKRON, O., Nov. 3—The Swinehart Tire & Rubber Co. has declared a quarterly dividend of 1 1-2 per cent. payable January 15. The books close December 31.

S. A. E. Winter Meeting January 6-7

Professional Sessions on Both Days—Standards Committee Meets November 17-19

NEW YORK CITY, Nov. 2—The full program of the winter session of the Society of Automobile Engineers has been announced. Professional sessions are scheduled for the morning, afternoon and evening of January 6 and 7 in the Engineering Societies Building, 29 West 39th street. Plans are being made to have the members dine together informally on each of the meeting days.

The Standards Committee convention will be held November 17-19 in the rooms of the society at 1790 Broadway. The purpose of this meeting is to provide an opportunity to discuss the various standards and practices under consideration for recommendation, as well as some standards and practices that have been accepted heretofore. It is expected that reports will be made by several of the Standards Committee divisions. The subjects which will probably be touched upon are the following:

Stock sizes of roller bearings.
Flanges for side outlet carbureters.
Thickness of truck felloe bands.
Electric vehicle standards.
Industrial truck standards.
Properties of S. A. E. steels.
Heat treatment of steels.
Steel casting specifications.
S. A. E. lock washer standards.
Non-glaring headlights.
Wiring systems for motor cars.
Scientific tests for engines.
Horsepower formula data.
Pneumatic tire stock sizes.
Tap drill sizes.
Vehicle taxation formula.
Leaf spring clips.
Bell housings for unit plants.
Motor support dimensions.

The council will hold a meeting at the time of the convention and meetings of about a dozen of the divisions and sub-committees of the Standards Committee will be held during the 3 days' convention. Members of the society who can attend are welcome at the Standards Committee meeting.

Weed Wins Another Final Injunction

DETROIT, MICH., Nov. 3—*Special Telegram*—Judge Tuttle in the United States District Court here has issued a perpetual injunction restraining Arthur S. and Milton H. Perry from doing business under the name of the Perry Chain & Grip Co., the Union Steel Screen Co. and the Motor Specialty Co. from making automobile tire chains and held that patent No. 723,299 was duly issued to Harry Parsons, March 24, 1903.

This is the final decision in the suit brought by the Weed Chain Tire Grip Co. and the Parsons Non-Skid Co., Ltd., and Harry D. Weed, who are allowed about $18,000 profits and interest made by the Perrys.

Poole Makes Report on European Conditions

DETROIT, MICH., Oct. 30—The first report concerning business conditions in Europe written by John L. Poole, European export manager of the Hupp Motor Car Co., since his return to Europe was received a few days ago and concerns the situation in the United Kingdom.

"In general," writes Mr. Poole, "business conditions have improved in the Kingdom, and I can see no reason why we should not do a fairly good business in the motor car line during the coming season, unless, of course, England itself is open to an invasion by some hostile nation.

"As the Olympia, the annual motor car show of England, will not be held this season, Whiting, Ltd., Hupmobile distributors for the British Isles, will hold a motor car exhibit of its own, and anticipate a visit at that time from the eighty odd dealers who are located throughout England, Scotland and Ireland.

Nine Papers for Chicago Road Congress

NEW YORK CITY, Nov. 2—The American Road Builders' Assn., this city, has received acceptances from a number of well-known highway officials and engineers, announcing their willingness to prepare the leading papers on various subjects to be presented at the American Good Roads Congress to be held in Chicago, December 14-18. The acceptances so far received and their subjects are as follows:

"Road Foundations: Concrete, Telford, Gravel, Etc.," L. A. Johnston, division engineer, Massachusetts Highway Commission.

"Organization of a State Highway Department," John N. Carlisle, Commissioner of Highways of the State of New York.

"Traffic: Present Tendencies, Probable Development, Regulation," A. W. Dean, chief engineer, Massachusetts Highway Commission.

"Machinery for Construction and Maintenance: State, Municipal, Contractors, Traction Haulage of Stone, Care of Machinery, Instructions to Engineer and Operator," T. R. Agg, professor of highway engineering, Iowa State College.

"Brick Roads and Streets," John Laylin, division engineer, State Highway Department of Ohio.

"Surfaces or Floors for Bridges," Clifford Older, bridge engineer, Illinois Highway Department.

"Bituminous Construction and Maintenance, Recent Practice," William D. Uhler, assistant engineer, Bureau of Highways, Philadelphia, Pa.

"Concrete Roads," H. J. Kuelling, County Highway Commissioner, Milwaukee County, Wisconsin.

"Street Paving in Small Cities," Thomas H. MacDonald, State Highway Engineer of Iowa.

Saxon Adds Light Delivery for $395

DETROIT, MICH., Nov. 2—The Saxon company has branched out into the commercial field by adding a delivery car of 400 pounds carrying capacity to its well-known two-passenger type and selling at the same figure of $395. This vehicle is mounted on the same chassis as the roadster, and with its light weight it should have a big field among the various lines of business requiring quick delivery of light packages.

With practically the same bonnet and control features, the main change is the placing of an open-box type of body back of the driver's seat, which body has about the same length front and back of the rear axle. The carrying space is 48 1-4 inches long and 38 inches wide, with the sides 45 inches high.

The Saxon chassis has a wheelbase of 96 inches, is carried on 28 by 3 tires, on wire wheels, has cantilever spring suspension and a 15-horsepower motor, 2 5-8 by 4.

This motor is a four-cylinder L-head with cylinders and crankcase cast in one piece. It operates through a two-bearing crankshaft of drop-forged steel. Helical timing gears housed at the front operate the camshaft which is also a drop-forging having integral cams. Cooling is by thermo-syphon, ignition by Atwater Kent distributer system, and lubrication by the vacuum-feed arrangement. In this the level of the lubricant is automatically maintained at the same height as the controlling feed standpipe.

The clutch is a five-plate disk type steel against Raybestos, while drive to the rear is through a shaft enclosed within a torsion tube, this shaft being fitted with a universal joint at the front end. The gearbox, affording two forward speeds, is mounted on the rear axle, being controlled by center lever. The rear axle is of the semi-floating type with a pressed-steel housing, the outer end of the drive shaft being carried on Hyatt roller bearing, while the two-pinion differential is of plain bearing construction.

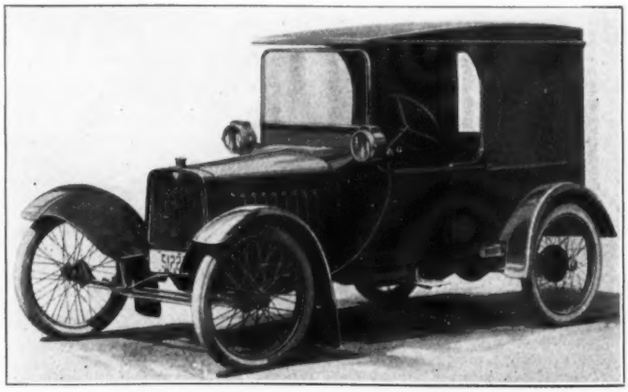
There are two sets of brakes on the rear wheels, the service set being 8 inches diameter Thermoid lined, while the emergency is steel on steel, 7 11-16 inches diameter.

The listed equipment is top and storm curtains, windshield, two gas headlights, oil rear lamps, gas generator and bulb horn.

The tread of the Saxon is standard 56 inches.

Gas-Electric Taxicab for N. Y. Taxicab Co.

NEW YORK CITY, Oct. 29—That the Mason-Seaman Transportation Co. will probably employ the combination of the gasoline engine and the electric motor in its taxicabs, is stated by W. H. Barnard of that company. Mr. Barnard states the company is at present experimenting with a new 1,000-pound cab which will be propelled by the above system, the invention of Mr. Rockwell, also of that company.



New Saxon light delivery car on standard chassis

National Shows Have 548 Exhibitors

118 Accessory Makers Take Space in Addition to Those Previously Announced

NEW YORK CITY, Oct. 30—Judging from the number of exhibitors who have been allotted space for the Fifteenth Annual National Automobile Shows to be held in New York and Chicago, it is evident that manufacturers of automobiles, motorcycles and accessories are preparing for the greatest year of business in the history of the industry. Announcement already has been made by Manager S. A. Miles, of the car exhibitors who will display their products at both shows, and the Motor and Accessory Manufacturers have announced the space allotted to their members. However, since those announcements were made 118 accessory makers and 13 motorcycle concerns have secured space for the national shows, bringing the total number of exhibitors for both exhibitions up to 548. The New York Show is to be held in the Grand Central Palace, January 2-9, and the Chicago show will be held in the Coliseum and First Regiment Armory from January 23 to 30. The complete list of accessory manufacturers exhibiting at both shows to date is given below:

Panama-Pacific West's First Big Show

SAN FRANCISCO, CAL., Oct. 28—The first show of any magnitude west of the Rockies covering the automobile industry will be held in the Palace of Transportation at the Panama-Pacific International Exposition the coming year. Nearly 40 per cent. of the space in the mammoth structure built to house the transportation exhibits is given over to the makers of pleasure cars and accessories. The available space has been heavily over-subscribed and the department has been compelled to utilize every available foot of space possible in an effort to accommodate the exhibitors.

There are several noteworthy features connected with the coming automobile exhibition. Divisions have marked the holding of a number of shows in the east in the past, the manufacturers and their dealers grouping themselves into associations and holding separate exhibitions. There are no such restrictions regarding exhibitors at the coming show, the gates being thrown open to any worthy exhibit.

The automobile section occupies nearly the entire eastern half of the building. Running along the north and south central aisle in the nave of the building is a façade of Italian pergola design and divides the section from the other portion of the building. There are domes over the entrances to the aisles in the section for a lattice-work effect

The accessory manufacturers and dealers are given space along the side walls of the section. The walls about and above their exhibits will be decorated by the exhibitors themselves.

The exhibits in the section will be many and varied. In addition to the usual display of finished types of cars will be shown cutaway chassis, cars in course of construction, assembling plants and the making of various parts. The exhibits are intended to have a distinct educational value.

The official headquarters for automobilists will be found in the offices of the California State Automobile Assn., located just to the east of the main entrance. A well-equipped information bureau will be maintained.

Boston Electric Show Opens with 10 Exhibits

BOSTON, MASS., Oct. 30—The Second Electric Automobile Salon under the auspices of the Electric Motor Car Club of Boston is being held in the Grand Ballroom of the Copley Plaza Hotel in Boston from Monday to Friday, November 2 to 6, inclusive.

It is not quite so crowded as last year's Salon for there are but seventeen vehicles exhibited while the first one had twenty-six. But it is a really representative exhibition, for all the various types made by the electric men are displayed. There is a good chance to note the tendency of some makers toward the streamline design of body; the five-passenger model, by widening the bodies and the wire wheel.

Special attention has been given this year to interesting a large number of prospective purchasers over a wide territory including Boston and the prominent cities and towns within a radius of 40 miles. A special list of prominent people has been prepared and invitation cards mailed to them. Over 16,000 cards have gone out in this way in addition to the large number mailed by the Boston representatives of electric automobile manufacturers to their prospects.

The exhibitors and the number of cars displayed are:

NAME OF CAR	NO.
Bailey	3
Buffalo & Babcock	1
Detroit Electric	5
Ohio	2
Rauch & Lang	3
Waverley	3

ACCESSORIES	TYPE
Edison Storage Battery Co.	Batteries
Electric Storage Battery Co.	Batteries
Philadelphia Storage Battery Co.	Batteries
Wagner Electric Mfg. Co.	Rotary Converters

WASHINGTON, D. C., Oct. 30—President Sturgis, of the American Institute of Architects, has appointed a committee, composed of E. C. Jensen, Chicago, W. T. Mills, Columbus, and Benjamin Hubbell, Cleveland, to act in an advisory capacity to the Lincoln Highway Assn.

The purpose is to insure uniformity in treatment of all the bridges, markers, stations and monuments.

LIST OF ADDITIONAL ACCESSORY EXHIBITORS AT NEW YORK AND CHICAGO SHOWS

Adams & Co., Henry T. ..... Chicago, Ill.
Ajax Trunk & Sample Case Co., New York, N. Y.
American Taximeter Co. ..... New York, N. Y.
Arnold, N. B. ..... Brooklyn, N. Y.
B. & L. Auto Lamp Co. ..... New York, N. Y.
Benjamin Electric Mfg. Co. .. New York, N. Y.
Braender Rubber & Tire Co. .. Rutherford, N. J.
Brown Co. ..... Syracuse, N. Y.
C. R. G. Mfg. Co. ..... Saugus, Mass.
Champion Spark Plug Co. ..... Toledo, O.
Chicago Electric Specialties Co. .. Chicago, Ill.
Cleveland Worm & Gear Co. ..... Cleveland, O.
Cutler-Hammer Mfg. Co. ..... Milwaukee, Wis.
Dann Oil Cushion Spring Insert Co., Chicago, Ill.
Detroit Steel Products Co. ..... Detroit, Mich.
Dreadnaught Tire & Rubber Co., Baltimore, Md.
Edeman & Co., E. ..... Chicago, Ill.
Forest City Electric Co. ..... Cleveland, O.
Frazer Lubricator Co. ..... Chicago, Ill.
Globe Rubber Tire Mfg. Co. .... Trenton, N. J.
Grossman Mfg. Co., Inc., Emil, Brooklyn, N. Y.
Hans Motor Equipment Co. .. La Crosse, Wis.
K-W Ignition Co. ..... Cleveland, O.
Kemco Electric Mfg. Co. ..... Cleveland, O.
Lawrence & Co., L. ..... Newark, N. J.
McQuay-Norris Mfg. Co. ..... St. Louis, Mo.
Mayo Mfg. Co. ..... Chicago, Ill.
Metal Stamping Co. .. Long Island City, N. Y.
Morrison-Ricker Mfg. Co. ..... Grinnell, Ia.
Newmastic Co. ..... New York, N. Y.
New York Coil Co. ..... New York, N. Y.
Peerless Motor Specialty Co. .. New York, N. Y.
Perkins-Sampbell Co. ..... Cincinnati, O.
Platt & Washburn Refining Co., New York, N. Y.
Power Gas Products Co., Inc., Minneapolis, Minn.
Pyrene Mfg. Co. ..... New York, N. Y.
Sharrer Patent Top Co. ..... New York, N. Y.
Smalley Daniels ..... Detroit, Mich.
Standard Woven Fabric Co., Framingham, Mass.
Steel Pneumatic Tube & Tire Co., New York, N. Y.
Stevens & Co. ..... New York, N. Y.
Tingley & Co., Charles O. ..... Rahway, N. J.
Triple Action Spring Co. ..... Chicago, Ill.
United States Air Compressor Co., Cleveland, O.
Universal Shock Eliminator Co., New York, N. Y.
Wayne Oil Tank & Pump Co., Fort Wayne, Ind.

NEW YORK ONLY

American Express Co. ..... New York, N. Y.
Armstrong Cork Co. ..... Pittsburgh, Pa.
Asch & Co. ..... New York, N. Y.
Ashley Wire Wheel & Rim Co., New York, N. Y.
Ashland Mfg. Co. ..... Ashland, O.
Auto Rescue Mfg. Co. ..... Streator, Ill.
Baum's Castorine Co. ..... Rome, N. Y.
Baush Machine Tool Co. .... Springfield, Mass.
Berg Auto Truck & Specialty Co., New York, N. Y.
Bontempi Rust-Proofing Co. .. New York, N. Y.
Davis Mfg. Co., D. D. ..... Chicago, Ill.
Essex Rubber Co. ..... Trenton, N. J.
Faw, Inc., J. J. ..... New York, N. Y.
Fentress-Newton Mfg. Co. ..... Detroit, Mich.
Fitzgerald Mfg. Co. ..... Torrington, Conn.
Flentje, Ernst ..... Cambridge, Mass.
Frasse & Co., Inc., Peter A. .. New York, N. Y.
Fulton-McCutcheon Co. ..... Chicago, Ill.
Haverford Cycle Co. ..... Philadelphia, Pa.
Holt-Welles Co. ..... New York, N. Y.
Houpert Machine Co. ..... New York, N. Y.
Kales Haskel Co. ..... Detroit, Mich.
Prosser & Son, Thomas .... New York, N. Y.
Laidlaw Co. ..... New York, N. Y.
Marathon Tire Sales Co. .... New York, N. Y.
Marvel Auto Supply Co. ..... Cleveland, O.
Master Carburetter Distributers, New York, N. Y.
Merritt Co., S. Whyle ..... New York, N. Y.
Mesinger Mfg. Co., H. & F. .. New York, N. Y.
Miller, Charles E. ..... New York, N. Y.
Mutty Co., L. J. ..... Boston, Mass.
O'Banron Corporation ..... New York, N. Y.
Pennsylvania Shafting Co. .... Spring City, Pa.
Reilly & Son, P. ..... Newark, N. J.
Rutherford Rubber Co. ..... Rutherford, N. J.
Silvex Co. ..... New York, N. Y.
Stanley Co., Inc., John T. .... New York, N. Y.
Steel Pneumatic Tube & Tire Co., New York, N. Y.
Stewart & Co. ..... New York, N. Y.
Waldt, Ralph ..... New York, N. Y.
Willey Co., C. A. ..... Long Island City, N. Y.

CHICAGO ONLY

American Wood Rim Co. ..... Onaway, Mich.
Breakstone, S. ..... Chicago, Ill.
Buchanan Electric Steel Co. .. Buchanan, Mich.
Buda Co. ..... Harvey, Ill.
Celfor Tool Co. ..... Buchanan, Mich.
Cleveland Hardware Co. ..... Cleveland, O.
Electric Products Co. ..... Cleveland, O.
Funke & Co., Inc., H. F. L. .. New York, N. Y.
Miller, Charles E. (Anderson Rubber Works), New York, N. Y.
Mossberg Co., Frank ..... Attleboro, Mass.
Niehoff & Co., Paul G. ..... Chicago, Ill.
Oakes Co. ..... Indianapolis, Ind.
Pierce Speed Controller Co. .... Anderson, Ind.
Pratt Mfg. Co., William E. ..... Chicago, Ill.
Stewart Auto Accessories Co. ..... Chicago, Ill.
Tuthill Spring Co. ..... Chicago, Ill.
United States Gauge Co. ..... New York, N. Y.
Universal Auto Eulpment Co. .. Detroit, Mich.
V-Ray Company ..... Marshalltown, Ia.
Wells Mfg. Co., R. C. ..... Fond du Lac, Wis.

Weidely Motors for the Trade

Weidely Motor Co. Organized—Engine To Be Sold Separate or with Entz Electric Transmission

NEW YORK CITY, Nov. 2—The Weidely Motor Co., of this city, is being incorporated to build Weidelv motors to be sold to the trade and also to be used in conjunction with the Entz electric transmission manufactured by the Entz Motor Corp., this city.

R. M. Owen, president of the Entz Motor Corp., which controls the patents for this electric transmission, has entered into an arrangement with H. O. Smith and George Weidely, recently of the Premier company, whereby the Weidely Motor Co. has been formed and will own and control the patents used in connection with this motor.

Arrangements have already been made with two large engine manufacturers in this country to build these motors for sale to the trade. In last week's issue of THE AUTOMOBILE it was stated that a contract had been made between Messrs. Owen, Weidely and Smith with the receiver of the Premier Motor Mfg. Co. whereby the patterns, etc., of the Weidely motor become the possession of the newly-organized Weidely Motor Co., and that the Premier Motor Mfg. Co. is given the privilege of using the Weidely motors. The Weidely motor will either be sold as a separate unit or those desiring can purchase it in connection with the Entz electric transmission, thereby giving complete motor and transmission in a single unit.

U. S. Rubber Earns Dividends

NEW YORK CITY, Oct. 31—Up to October 1, with September earnings partially estimated, the United States Rubber Co. earned its dividends with a considerable margin to spare. Estimate of earnings for October is not yet practicable and it is stated that the directors are not in a position to consider a continuation of the common dividend at a 6 per cent. rate. A dividend of 1 1-2 per cent. was declared on the common stock, payable November 1, so that there will be no further consideration of a dividend by the directors until the meeting early in January. Tire sales in September ran 35 per cent. behind the corresponding month a year ago. October will probably show approximately the same decline, as compared with 1913. While there was a 35 per cent. reduction in the value, the actual drop in the number of tires sold was considerably below the 35 per cent. figure. Tire prices a year ago were above those prevailing this Fall.

AKRON, O., Oct. 30—The B. F. Goodrich Co. has declared the regular quarterly dividend of 1 3-4 per cent. on the preferred stock, payable January 1 to stock of record December 21.

Detroit Starter Co. Organized

DETROIT, MICH., Oct. 30—The Detroit Starter Co. was organized recently and incorporated, the officers being J. W. Fitzgerald, president; F. J. Lamb, vice-president, and A. B. Porter, secretary-treasurer. Offices have been opened at 969 Jefferson avenue.

The concern is now marketing the new starter and lighting system, which is being manufactured for it on a mutual sharing arrangement by the Ross & Young Machine Co., whose present capacity is 200 starters a day.

Several of the local automobile manufacturing concerns are arranging for the adoption of the new starter on their 1915 models, and the Saxon Motor Co. recently announced that it will furnish this starter upon demand.

Tilikum Cyclecar Co. Formed in Seattle

SEATTLE, WASH., Oct. 30—The Tilikum Cyclecar Co., Seattle, has recently been incorporated and is headed by N. J. Veline, I. D. H. Adams and C. G. Benson. The car is unique in mechanical construction and body lines. The frame is fashioned after the Franklin wood frame, which reduces vibration and strain on mechanical parts. The tread is 42 inches. The seat accommodates two passengers side by side. The wheelbase is 84 inches, correctly proportioned with the tread. The motor is of the V type of 10 to 14 horsepower, air cooled. The transmission is by patented variable pulleys and belts which give the operator the choice of twelve distinct speeds, changing from any one to any other without disengaging the clutch. The car has been run from 40 to 60 miles on a gallon of gasoline.

AKRON, O., Oct. 29—Goodyear Tire & Rubber Co.'s salesman's conference was brought to a close October 31. Four hundred and fifty branch managers and salesmen were in attendance. The conference was preliminary to the launching of the company's 1915 campaign, and concludes a fiscal year in which the increase in the number of tires made and sold over 1913 was nearly 35 per cent. For 3 days the men from the selling field were the company's guests. They inspected the factory with its 2,000,000 square feet of floor space and watched the actual operations by which 7,500 workers turn out the Goodyear product. There were addresses, a banquet and other entertainment in the evenings, and the days were devoted to discussions of trade conditions.

Abner Doble Motor Vehicle Co. Incorporates

WILMINGTON, DEL., Oct. 30—The Abner Doble Motor Vehicle Co. has incorporated in this city with a capitalization of $500,000 to manufacture and deal in the Abner Doble steam automobile. The incorporators are G. W. Dillman, E. Price, M. M. Dugan, G. P. Postles and R. R. Whittingham.

A description of this car was published in THE AUTOMOBILE for April 9, 1914.

Shoemaker Resigns from A. A. A.

NEW YORK CITY, Oct. 30—T. B. Shoemaker, who for several years has served as secretary of the Contest Board of the American Automobile Association, has resigned. Chairman Kennerdell, has not as yet appointed a successor.

Splitdorf Alleges Bosch Infringes Patent

NEW YORK CITY, Nov. 2—The Splitdorf Electrical Co., Newark, N. J., has filed suit against the Bosch Magneto Co., New York City, alleging infringement of Patent No. 1,074,416, covering means in a magneto ignition system for changing the polarity of the armature to coincide with the polarity of an external current during the time that the primary winding on the armature is coupled with the external source of current. The object of this system is to use a battery and a coil in connection with the primary winding of the magneto to produce a sufficient current for ignition purposes for easy starting at low cranking speeds. This is commonly known as a duplex system.

Officials of the Bosch company state that they believe that Splitdorf's claims of infringement are not correct and that they will endeavor to prove this.

The patent in question was granted to John M. Dinkins, Franklin B. Hays and William L. Taylor, all of Indianapolis, Ind., September 30, 1913. Eight-fifteenths of the right, title and interests of the patent were transferred to William L. Taylor, and then by a written assignment dated July 10, 1914, the Splitdorf company became sole owner. This company alleges that the Bosch company has infringed since the date of the patent and since July 10, 1914.

The plaintiff prays for an injunction, as well provisional as permanent, and also that the defendant account for profits made by it and damages sustained by defendant, and that upon rendering of the decree the actual damages so assessed be tripled. The plaintiff also prays that the defendant defray the costs of the suit, and waives verification of the defendant's answer.

The suit is brought in the U. S. District Court for the Southern District of New York.

Denver Passes Anti-Glare Ordinance

DENVER, COL., Oct. 30—An ordinance designed to put an end to the dangerous glare of motor car and other vehicle headlights on Denver's streets has been passed by the city council and will go into effect tomorrow. An increasingly large number of serious accidents during the last year or more have been charged to the blinding glare of these unduly brilliant lights and a great deal of sentiment has developed in demand for a law to protect human life against this danger. In fact, many motorists themselves have declared the city behind the times because of its failure to remedy this deplorable feature of traffic conditions. The measure was urged and strongly backed by the Denver Motor Club, which has

pledged the city officials its hearty co-operation toward enforcing the provisions for dimming lights.

The principal clauses of the new ordinance are:

It shall be unlawful for any person operating any automobile, motorcycle or other vehicle, upon the public streets and highways within the city and county of Denver, to use acetylene, electric or other bright headlight or any headlights, the rays from which are intensified by any condensing reflector, unless such headlight shall be properly shaded or adjusted so as not to blind, dazzle or confuse other users of the highway or make it difficult or unsafe for them to ride, drive or walk thereon.

Grossman Gets Injunction in Patent Suit

NEW YORK CITY, Nov. 2—Thomas F. Wilson and the Emil Grossman Mfg. Co., Inc., have been granted a perpetual injunction against Harry Weinstein, doing business under the trade names of Royal Auto Tire & Supply Co., Liberty Tire & Supply Co. and Union Tire Co. The plaintiffs alleged infringement of their patent No. 1,044,468 covering a form of thrust bearing by the defendant's "Radius rod anti-rattlers for Ford cars." The decree was issued with the consent of the defendant.

The plaintiffs prayed for a perpetual injunction, delivery to them for destruction of all infringing devices, triple damages and costs, but waived damages and costs when the defendant turned over to them the infringing devices.

The suit was brought in the U. S. District Court for the Southern District of New York. The Emil Grossmann Mfg. Co., Inc., owns one-tenth interest in the patent at issue, the remainder belonging to Thomas F. Wilson, the other plaintiff in the suit.

INDIANAPOLIS, IND., Nov. 2—A suit asking for the appointment of a receiver for the United Supply & Accessories Co., Indianapolis, has been brought in the circuit court in that city by S. C. Rennick, manager of the company. Mr. Rennick alleges the company is in danger of insolvency and has been unable to obtain sufficient capital with which to conduct a paying business.

To Protest Proposed Uniform Law

BOSTON, MASS., Oct. 29—A special meeting of the Massachusetts Automobile Operators' Assn. was held last week at which the proposed uniform motor law now being considered by the commissioners on uniform laws at Washington was discussed. James Fortesque, secretary of the Massachusetts State A. A. and J. T. Sullivan of the Boston *Globe* addressed the meeting pointing out that according to dispatches it was intended to put in a clause requiring drivers to wear badges, and another that convictions should be written on licenses. It was pointed out that there was a badge clause in the Bay State motor law, but because of persecution by police of drivers the legislature took it out. Also that attempts to put in a conviction license clause has been rejected by the legislature several times. President J. E. Connors was then empowered to call a special meeting of the legislative committee to frame a protest to send to the commission, and this will be passed at the next meeting.

Hard Test of N. J. Drivers

TRENTON, N. J., Oct. 29—To what a great extent automobiles are used in New Jersey is indicated by the statement of State Motor Vehicle Commissioner Lippincott today, that from January 1 last to October 1, the number of persons examined by the department for drivers' licenses was 21,901. Of this number 19,471 were passed and 2,430 were rejected, showing that approximately 11 per cent. were unable to qualify as drivers.

Standard Oil and Gulf Refining Indicted

NEW YORK CITY, Nov. 2—Despite the fact that the Standard Oil Co. was absolved in the Hudson county court in New Jersey when charged with violating one of the Seven Sisters anti-monopoly acts by price-cutting, it, and the Gulf Refining Co., have been indicted by the Hudson county grand jury; these are the first indictments to be found under the Seven Sisters acts passed under the governorship of Woodrow Wilson.

The county court held that the Gulf and not the Standard company was at fault; the evidence before the grand jury was that the Gulf company started to cut the price of gasoline in May; Standard met the cuts; the price fell from 22 to 11 cents. The Crew-Levick company alleged that its business had been damaged and it was alleged that it was the intent of the big companies to "freeze out" smaller competitors. Should the indictments result in convictions the defendants may lose their charters; trial is expected this month.

Exports for September Total $892,192

WASHINGTON, D. C., Nov. 2—Figures issued today by the Federal Bureau of Statistics show that during September, 128 commercial cars, valued at $294,288, and 646 passenger cars, valued at $597,904, were shipped abroad. During the 9 months ending September the number of commercial cars exported was 637, the value being $1,066,545, while the passenger car exports amounted to 19,530, valued at $17,209,964.

Drawback Granted on Exported Cars and Parts

WASHINGTON, D. C., Nov. 2—A series of orders has been issued by the Treasury Department instructing collectors of customs in various cities to allow, under paragraph O, section 4 of the tariff act of 1913, drawback on the exportation of various articles, as follows: Automobiles: Packard, Baker electric, Chandler and Abbott; automobile axles, Hess Spring & Axle Co., Yuster Axle Co., for account of Chandler Motor Car Co., American Ball Bearing Co.; aluminum hoods, Michigan Stamping Co.; windshields, Universal Windshield Co.

NEW YORK CITY, Oct. 29—At the annual meeting of the J. S. Bretz Co. yesterday, the retiring directors and officers were re-elected. They are as follows: J. S. Bretz, president; Jack L. Straub, secretary and treasurer, and the directors are: J. S. Bretz, J. L. Straub, R. W. Leslie, John Hertzler and C. G. Tuthill.

BROOKLYN, N. Y., Nov. 3—The Brooklyn Garage Owners' Board of Trade has arranged through a coal committee to purchase coal and coke for members for the coming winter. At a meeting held Monday evening, November 2, this committee compiled a list of garagemen who will take a total of 800 tons. The association members are enthusiastic at the work the organization is accomplishing. At its inception it secured a brand of gasoline and oil on which it placed its stamp, and now is having manufactured by a well-known tire company a tube which is put out under the name of Board of Trade tube. Several new members were added at Monday's meeting.

Market Reports for the Week

No changes of any importance occurred in this week's market reports. The metal products were held more firmly and the oils and lubricants saw some quiet trading. A stronger tone in tin was developed at the end of the week, that product closing at a gain of $1.50 per 100 pounds. Lead was quiet and steady at $3.50 per 100 pounds. Antimony is quiet, but strong and prices are nominal. The crude rubber market was quiet. Trading conditions were dull, but the market had a firmer tone owing to the action of Turkey in entering the European war. It is feared that this may result in the closing of the Suez Canal and greatly interfere with shipments of rubber from the East. Up-river Para remained unchanged for the week at $0.66.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Changes
Antimony	.14	.14	.14	.14	.14	.14	.....
Beams & Channels, 100 lbs.	1.21	1.21	1.21	1.21	1.21	1.21	.....
Besemer Steel, ton	18.50	18.50	18.50	18.50	18.50	18.50	.....
Copper, Elec., lb.	.11¼	.11¼	.11¼	.11¼	.11¼	.11⅛	—.00$\frac{1}{20}$
Copper, Lake, lb.	.11⅜	.11⅜	.11$\frac{13}{16}$	.11⅛	.11⅛	.11$\frac{9}{10}$	—.00$\frac{1}{10}$
Cottonseed Oil, bbl.	4.70	..	5.10	5.08	5.08	5.01	+.31
Cyanide Potash, lb.	.25	.25	.25	.25	.25	.25	.....
Fish Oil, Menhaden, Brown	.40	.40	.40	.40	.40	.40	.....
Gasoline Auto, bbl.	.13	.13	.13	.13	.13	.13	.....
Lard Oil, prime	.90	.90	.90	.90	.90	.90	.....
Lead, 100 lbs.	3.50	3.50	3.50	3.50	3.50	3.50	.....
Linseed Oil	.47	.45	.45	.45	.45	.45	—.02
Open-Hearth Steel, ton	18.50	18.50	18.50	18.50	18.50	18.50	.....
Petroleum, bbl., Kans., crude	.55	.55	.55	.55	.55	.55	.....
Petroleum, bbl., Pa., crude	1.45	1.45	1.45	1:45	1.45	1.45	.....
Rapeseed Oil, refined	.82	.73	.73	.73	.73	.73	—.09
Rubber, Fine Up-River, Para	.66	.66	.66	.66	.66	.66	.....
Silk, raw, Ital.	..	4.25	..	..	..	4.25	.....
Silk, raw, Japan	..	3.20	..	..	..	3.23	+.03
Sulphuric Acid, 60 Baume	.90	.90	.90	.90	.90	.90	.....
Tin, 100 lb.	30.38	30.25	30.75	30.88	30.88	31.88	+1.50
Tire Scrap	.05	.05	.05	.05	.05	.05	.....

DePalma Wins Four at Brighton

Five Races Altogether—10 Mile Handicap Won by Chevrolet

NEW YORK CITY, Nov. 3—Ralph DePalma and his Grand Prix Mercedes starred at Brighton Beach race track today, taking four out of the five events and capturing $650 in prize money. The other race, a handicap, was won by LeCain in a Chevrolet. Jessup, also driving a Chevrolet, was second in this race, while DePalma took third honors.

The first event was non-stock, limited to cars with less than 300 inches piston displacement. The distance was 10 miles and Ralph easily drew away from the rest of the field, winning in 9 minutes 53 2-5 seconds. Morton, in a Mercer, was second and LeCain in a Chevrolet, third.

Event number two, for 10 miles for non-stock cars under 450 cubic inches, was won by DePalma who covered the distance in 9 minutes 34 seconds. Second went to John DePalma in Ralph's old six-cylinder Mercedes, and third was won by Morton, in the Mercer.

The third race was a non-stock free-for-all for 10 miles and was likewise taken by DePalma in 9:21 4-5. John DePalma was second and Morton, in the Mercer, third.

Next was the handicap and this proved the most interesting and exciting. LeCain's Chevrolet won, with his teammate Jessup at his heels. DePalma was third, his handicap being too large as he was the only one started from scratch, about a mile in the rear. The time was 9:53.

The fifth race was originally intended to be a 50-mile contest but it was shortened to 40 miles because of darkness. It was won by DePalma, with Morton and the Mercer second and LeCain and the Chevrolet third. The time was 37 minutes 27 2-5 seconds. The little Mercer has a Fritz carbureter.

Greeks Give Out Truck Specifications

NEW YORK CITY, Nov. 4—Specifications for the 400 additional motor trucks for the Greek army, to supplement the fifty KisselKar vehicles recently purchased have been given out. These cover 1 1-2-ton chassis of standard construction, shaft-driven, with uniform tire sizes front and rear, four-speed gearboxes, good clearance, fairly high speeds, and equipped with service bodies. Among the peculiar requirements are stiff, heavy springs of little flexibility, double-jet carbureters, demountable rims, driving shaft brakes, and auxiliary water tanks under the driver's seat. The specifications follow:

Frame—Pressed steel, simple and strong.
Motor—Flexible; monoblock, 3½ by 5½, with compression release and governor set at 30 miles per hour.
Differential—Light, of dimensions as constrained as possible, and capable of resisting most violent brake strains.
Carbureter—Latest type, with double jets.
Magneto—High-tension.
Front wheels—Detachable rims, 35 by 5 tires.
Rear wheels—Strong; demountable rims, 35 by 5 tires.
Drive—Cardan shaft, with two universals preferred.
Springs—Front and rear very strong with lititle flexibility.
Maximum load—3,306 pounds.
Steering—Practically irreversible, all movable parts with grease cups, and all parts very strong.
Clutch—Smooth-acting, metallic preferred.
Gearset—Strong, with four speeds forward and one reverse; selective type preferred.
Brakes—Two sets; one back of gearbox preferred; handbrake on both rear wheels.
Gasoline tank—At rear, pressure fed, holding 25 gallons; strongly secured to chassis and placed as high as possible, 20 inches from ground.
Water tank—Under driver's seat; capacity 8 gallons at least, with a cock at the outside of body.
Radiator—Of sufficiently large surface to avoid boiling of water even under the highest temperature of 104 degrees Fahrenheit in the shade; should be mounted on a shock-absorber and should have a drain cock.
Fan—Flywheel fan preferred, or else two fans.
Clearance—11.8 inches.
Lubrication—Constant-level splash-pressure system.
Speed—The truck must attain a speed of 27.9 miles per hour on the level with full load.
Body—Light and strong, of careful construction, with 43 square feet of floor-area, and with tailboard to fold down on hinges to form steps; equipped with top.
Seats—For two, driver's seat roomy and low, with an abundance of leg-room.
Cab—Must have top of folding type, which is substantial when folded.
Windshield—Solid, but folding outward; constructed to permit easy replacement of glass.
Tools—Each truck must have a kit of tools in a tool box well located in the body.
Spare parts—Complete set of most needed spare parts.

Fast Time at San Antonio Track

SAN ANTONIO, TEX., Oct. 31—Fast time, clever driving and close finishes featured the opening of the San Antonio Automobile Club's automobile races at the Fair Grounds track this afternoon. The day was ideal and a good mid-week crowd saw the events.

The following are the results of the first day's events:

Class E, 3 Miles

CAR	DRIVER	TIME
Ford	Hoffman	4:20
Buick	Meleun	
Studebaker	Johnson	

Class E, 600 Cu. In.—9 Miles

Simplex Zip.	Disbrow	9:10⅘
Case Special	Ulbricht	
Braender Bull Dog	Chandler	

Class E, 300 Cu. In.—6 Miles

Scat	Cleary	6:05
Mercer	Milton	
Ford	Hoffman	

Team Novelty Relay Race

CAR	DRIVER	TIME
Case	Hearne	4:34
Braender Bull Dog	Chandler	
Simplex	Disbrow	
Case Special	Ulbricht	

Class D, Free for All—9 Miles

FIRST HEAT

Case	Hearne	8:56⅘
Simplex	Disbrow	

SECOND HEAT

Case	Ulbricht	9:15
Mercer	Milton	

HANDICAP—4 MILES

Simplex	Disbrow (Scratch)	3:36
Ford Special	Hoffman	

A. A. A. Gives Sanction for Indianapolis 500 Mile Race

INDIANAPOLIS, IND., Oct. 31—Official sanction has been obtained by the Indianapolis motor speedway from the American Automobile Assn. for its next 500-mile race, thereby refuting recent reports to the effect that the owners of the Hoosier track contemplated breaking with the parent organization. Speedway officials assert that they are on the friendliest terms with the A. A. A. and have no thought of taking independent action.

The recent announcement by the track management that it would in the future supervise manufacturers' tests on its own responsibility, is declared well founded on precedent, similar trials having been conducted under the auspices of the Chicago Automobile Club, without A. A. A. sanction; nor, it is said, is there any animus manifested toward the A. A. A. by the speedway in taking such action. Everything points toward a most successful contest season in 1915, it is stated, so that to stir up a row at this time would be considered wholly unwise.

Race Track Planned for Omaha

OMAHA, NEB., Oct. 30—An automobile race track 2 miles in length and pitched at an angle varying from 10 to 42½ degrees will be erected in Omaha soon. It is planned by the builder, Jack Prince, to have it in readiness by November 25, Thanksgiving day, and to have Barney Oldfield, Bob Burnham and Louis Disbrow as the opening attraction. It will cost approximately $150,000.

The automobile speedway is to be located near the present motorcycle speedway. In connection with the two speedways there will also be an aviation field. The first big racing meets will not be held until next spring.

Brad-Kent-Equipped Ford Does 33 M.P.G.

CHICAGO, ILL., Oct. 29—To demonstrate the fuel economy of the Brad-Kent carbureter, made by the Frost Mfg. Co., of Kenosha, Wis., a run from Chicago to Milwaukee was made on October 23, under the direction of F. E. Edwards, chairman of the technical committee of the Chicago Automobile Club, which resulted in the average of 33.12 miles to the gallon being made in a 1913 model T Ford.

It was a cross-country run of 102.1 miles and conditions were not at all favorable, there being a 25-mile-an-hour head wind to buck, while the roads were rough in many places. Also the car was held up several times in the traffic of the cities through which it passed. The thermometer varied from 50 in the morning to 59 in the afternoon.

The weight of the car with passengers was 2,050 pounds and the gasoline was of 63 degrees at 60 degrees Fahrenheit. The exact fuel consumption was 3 gallons 10.5 ounces. It took 4 hours 28 minutes to make the run.

2-Mile Saucer for Twin-City Races

To Cost $1,250,000—80 Feet Wide—2,200 Foot Banked Curves

MINNEAPOLIS, MINN., Oct. 30—The Twin-Cities are to have one of the greatest motor speedways in the world, according to the plan of organization adopted at a special meeting in this city tonight when the Twin-City Speedway Association was started with a capital stock of $1,000,000, of which $350,000 in common stock was taken by F. H. Wheeler, Indianapolis, Ind., one of the four to finance the present Indianapolis speedway. The remainder of the stock was taken by Twin-City interests before the close of the meeting.

The new speedway is to be entirely a Twin-City affair and will be a 2-mile platter-shaped track 80 feet wide, and having on either side gravel safety zones 32 feet wide. The track will be banked throughout its entire circuit, the banking being 2 per cent. on the straightaways and 35 per cent. on the turns. The radius of the curves will be 2,200 feet. It will be 4.5 miles from the court house in either St. Paul or Minneapolis.

The present plans are to have a 300-mile race on Labor Day next year, which will be the only meet of the season. The motor sizes for this race have not as yet been announced nor have the prizes.

The organization, which will handle this new $1,250,000 speedway, for this is what it is expected to cost, is headed by F. H. Wheeler, president; Henry Habighorst of St. Paul, and J. D. Hogan, Minneapolis, as vice-presidents; Dr. C. E. Dutton, secretary; W. D. Hogan, treasurer, and directors, O. Kellogg, J. F. Sperry, and Judge Frank McNulty, of Aberdeen, S. Dakota. With the exception of Judge McNulty and Mr. Wheeler, all of the officers are Minneapolis and St. Paul business men.

Financing Scheme

In the organization there is to be an issue of $750,000 bonds bearing 8 per cent. interest, which may be retired at interest-paying dates at 3 per cent. per annum. The Van Sant Investment Co., of St. Paul has been made fiscal agent.

The new speedway is to be located in a section known as Longchamp Park. It is bounded by Snelling, Hamlin and Crosley avenues and Larpenteur Road, all boulevards leading direct from the cities. It is within reach of the Twin-City street car lines, which will be extended to take care of the grounds, and close to all the railroad lines that enter St. Paul and Minneapolis. Transportation facilities by street car, train, motor car and on foot are unexcelled.

Seats for 106,000

Plans have been drawn by Walter D. MacLeith of St. Paul, and some of the contracts will be let within a month. It is estimated that the grandstands will seat 76,450 persons and the bleachers an additional 30,000. There will be accommodations within the grounds for 100,000 motor cars.

The buildings within the oval of the track will be sunk so as not to interfere with a view of people sitting in the parked motor cars. The track itself will be below the level so that the grandstand, beginning level with the ground at the upper edge of the speedway will furnish a view to all people, whether in the boxes at the ground level, or at the top. The general type of the buildings will be progressive Spanish, in plain lines and finished in overcast stucco. Opposite the grandstand will be forty pits. The judges' stand will be four stories, accommodating 300 officials, 300 press and telegraph men, with over capacity of 100 more.

The equipment of buildings includes, beside the grandstand and bleachers, a hospital, two round house garages, power plant, twenty-two toilets, four towers in the fence, and judge and press stand to accommodate 700, connected with the grandstand opposite by a suspension bridge at the start line, and bandstand for 300 pieces. On the ground floor rear will be the entrances, with subway for motor car delivery and bridges for pedestrians to enter. On the second floor will be an automobile exhibition room, 56 by 3,225 feet, with posts only every 50 feet. Seats will be of wood. In the 1,625 boxes will be six large arm chairs each with table for service from the seven restaurants. The third story will be for storage. The hospital will be 40 by 60 feet with an operating room 12 by 18 feet and room for physicians and nurses.

In building the track, the base will be 12 inches of rolled trap rock, and the facing 6 inches of concrete laid in two layers of 3 inches each. Each side of the track is to be a 2 1-2-foot concrete breast wall topped with a 10-foot fence of 12-gauge wire to keep tires from being thrown out of the track. Ninety thousand yards of trap rock will be needed for the bed work. Four miles of fence 8 feet high will surround the entire grounds. This fence will be pierced by three gateways admitting twelve people per second. There will also be three automobile entrances capable of admitting six automobiles abreast every second.

The possibilities of attendance at this speedway become real when it is remembered that there is a population of 850,000 within a radius of 50 miles. To this can be added the vast Northwestern territory one of the richest agricultural sections in the country and a section which has been one of the greatest buyers of motor cars.

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Overland's October Business Totals $5,572,000

TOLEDO, O., Nov. 3—October was the biggest month's business in the history of the Willys-Overland Co., which shipped 5,601 cars valued at $3,572,000. This was an increase of 15 per cent. over the same month's sales in 1914.

Since January 1, 11,368 more cars have been shipped than to the same date last year. The company has 18 per cent. more unfilled orders now than for the same time last year.

At the annual meeting of the stockholders of the company, October 26, all the officers and directors were re-elected. John N. Willys again heads both The Willys-Overland and Garford companies, with Isaac Kinsey as first vice-president; C. S. Jameson, second vice-president; R. R. Scott, secretary; Walter Stewart, treasurer; W. E. Tigges, comptroller, and E. L. Clapp, assistant treasurer, of the Willys-Overland Co., and C. S. Jameson, vice-president; R. R. Scott, secretary; and Walter Stewart, treasurer of the Garford Co.

The board of directors of the Willys-Overland Co. consists of John N. Willys, Isaac Kinsey, C. S. Jameson, R. R. Scott, Walter Stewart, H. L. Shepler and Rathbun Fuller, all of Toledo. The directorate of the Garford Co. is the same, except that H. L. Hooke's name appears in place of that of Rathbun Fuller.

H. L. Hooke was appointed manager of the Willys-Overland plant in Toledo and J. H. Gerkins was reappointed cashier and E. E. Weiss, assistant cashier.

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Eisemann Adds Space—Works Double Shift

NEW YORK CITY, Nov. 4—The Eisemann Magneto Co., Brooklyn, N. Y., has found it necessary to add 15,000 square feet of manufacturing space to its factory, and to also work a double shift. This double shift has been in operation for 3 weeks, while previous to that the force was working 3 hours per day overtime. The company expects this overtime work to continue for the next 5 or 6 months.

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Custodian Appointed for Havers Company

DETROIT, MICH., Nov. 3—*Special Telegram*—Judge Tuttle in the United States District Court yesterday appointed Lee E. Joslyn Referee in Bankruptcy as custodian of Havers Motor Car Co., Port Huron, Mich. Three creditors claiming an aggregate of $20,595 due merchandise, petitioned the court to have the company adjudged bankrupt.

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Fifth Avenue Coach Co. Earns $226,673

NEW YORK CITY, Nov. 3—The Fifth Avenue Coach Co., this year increased its net earnings $62,217 over last year, the income from operations amounting to $226,673. The total revenue amounted to $1,176,650.

The report of the company for the year ended June 30 last, compares as follows:

	1914.	Increase.
Total revenue	$1,176,650	$240,982
Total expenses and taxes	949,977	178,765
Income from operation	$226,673	$62,217
Other income	4,472	1,721
Gross income	$231,145	$63,938
Deductions	40,708	3,853
Net income	$190,437	$60,085
Profit and loss adjustment debit	10,175	10,744
Surplus	$180,262	$49,341

Factory Miscellany

PREPARING Chevrolet's Tarrytown Plant—Machinery is rapidly being installed in the new plant of the Chevrolet Motor Co. at Tarrytown, N. Y. This group of buildings, which comprised the old Maxwell factory, is the third Chevrolet factory. The main one is in Flint, Mich., and there is one in the heart of New York City. It is stated that the Tarrytown plant will be capable of turning out 10,000 cars per year when equipment is complete, while the New York City factory can produce 6,000 machines, under pressure. The plant at Tarrytown consists of two large, long buildings. The main one is approximately 750 feet long, 60 feet wide and three stories high throughout nearly its whole length. Paralleling this building is a one-story structure. A unique plan of production has been adopted by the company. Instead of concentrating the production in one central factory in the Middle West, it believes in locating assembling plants near points of great demand, such as New York City. Therefore, in these two Eastern plants the cars are completely assembled from parts received from the main factory in Flint and from certain parts and accessory makers. The city factory takes care of local customers and most of the shipments from this factory are made on the wheel while the Tarrytown factory is for the other parts of the territory, which embraces New England, New York State, eastern Pennsylvania and the States South bordering on the Atlantic. The advantages of these sub-factories, it is claimed that freight charges are reduced both on parts and on finished product. The factory being located close to the dealer, can give the latter individual attention and better service, and as there are comparatively few dealers, the members of this factory organization soon get to know all the dealers personally, and can, therefore, help them in marketing the product. The dealers, on the other hand, being in such close touch with the factory, can often give valuable suggestions to the manufacturer.

Auto Products to Add—The Auto Products Co., Canal Dover, O., has plans for a one-story reinforced concrete, brick and steel factory building, to be built at a cost of $15,000.

Lamp Plant in Los Angeles—J. P. Sherriffs will build a factory at 117 36th Place, Los Angeles, Cal., for the manufacture of automobile lamps. The building will be 50 by 124 feet in size, and will cost about $10,000.

Visit Canadian Factories—A large deputation from the French School of Commerce of McGill University, Montreal, Que., to the number of about thirty have recently been visiting the various manufacturing plants of the city.

New Ford Plant in Canada—A new factory is being erected at a cost of $300,000 for the Ford Motor Car Co., of Ford, Ontario, Canada. The building is to be six stories high, 200 by 195 feet in dimensions, of steel and reinforced concrete construction.

Victoria Plant in New Hands—The Auto-Rebuilding Co., Pembroke and Douglas streets, Victorial, B. C., manufacturer of automobile bodies, wheels, springs, engines, etc., has been taken over by a local syndicate with increased powers and larger working capital. The output of the plant will be increased.

New Plant for Shaw Motor—The Shaw Motor Co., Chicago, Ill., has decided upon the city of Prairie du Lac, Wis., for the location of its new plant. The plans call for a brick and concrete shop building, 60 by 108 feet, one story, with a saw-tooth roof, equipped for the production of gasoline engines. The investment on the new plant will be approximately $35,000.

Hoover to Manufacture Balls—The Hoover Steel Ball Co., Ann Arbor, Mich., which has been importing from Germany steel balls to the amount of $200,000 to $300,000 annually, has decided to manufacture a line of fine balls inasmuch as their importation from Germany has been stopped by the war. This year the stockholders of the company are receiving a dividend of 8 per cent.

New Ford Tire Co.—The Toledo-Ford Tire Co. will locate in Findlay, O., and expects to begin operations about the first of the year. The company will be capitalized at $300,000 and sell tires direct to the user. The Findlay factory will make tires in two sizes only and specialize on Ford automobile tires, reducing the cost very materially. They will sell, it is announced, 25 per cent. below the ordinary cost and save to the user about $19 per set.

Sparks-Withington Reports Good Business—"Business has never been better and the general outlook as bright," said President Sparks, of the Sparks-Withington Co., Jackson, Mich. "We have sufficient orders on hand now to keep us busy at least 90 days by working our entire force of 300 men at from 14 to 24 hours a day. Of course, the men do not work that many hours at one time, but per day and night shifts. Our home trade is excellent, but our foreign business is no less satisfactory, especially the business coming from Europe. A few days ago we received a cable order for 240 horns from Sweden and also a shipment went forward to Finland."

The Automobile Calendar

Nov. 2-6.....Boston, Mass., Salon, Copley Plaza Hotel.
Nov. 3.....Long Island A. C. Century Run.
Nov. 7-8-9.....Los Angeles, Cal., Los Angeles-Phoenix Road Race, Maricopa Auto Club.
Nov. 8.....Philadelphia, Pa., Fletcher Cup Run, Automobile Club of Philadelphia.
Nov. 8-9.....El Paso, Tex., El Paso-Phoenix Road Race, El Paso Auto Club.
Nov. 8-11.....Shreveport, La., Track Meet, Shreveport Auto Club.
Nov. 9-14.....Atlanta, Ga., Fourth American Road Congress.
Nov. 12.....Phoenix, Ariz., Track Race, Maricopa Auto Club.
Nov. 14-21.....Providence, R. I., Show, State Armory, P. S. Clark, Mgr.
Nov. 16-21.....Spokane, Wash., Show, Spokane Chamber of Commerce and the National Apple Show, Inc., G. C. Corbaley, Secretary.
Nov. 17-18-19....Harrisburg, Pa., Second Conference of Pa. Industrial Welfare and Efficiency, State Capitol.
Nov. 26.....Corona, Cal., Road Race, Corona Auto Assn.
Dec. 1-4.....New York City, Annual Meeting of the American Society of Mechanical Engineers.
Dec. 12-19.....Akron, O., Show, Akron Auto Show Co., O'Neill Bldg.
Dec. 14-18.....Chicago, Ill., American Good Roads Congress.
Jan. 2-9.....New York City, Annual Automobile Show, Grand Central Palace.
Jan. 3-10.....Buenos-Aires, Argentina, Grand Prize of Argentina.
Jan. 9-16.....Philadelphia Show.
Jan. 11-16.....Buffalo, N. Y., Show, Broadway Auditorium, Automobile Club of America.
Jan.16-23.....Cleveland, O., Show, Cleveland Automobile Show Co., F. H. Caley, Mgr.
Jan. 23-30.....Chicago, Ill., Automobile Show, First Regiment Armory.
Jan. 23-30.....Montreal, Que., Show, Allen Line Liverpool Bldgs., Montreal Automobile Trade Assn., T. C. Kirby, Mgr.
Jan. 30-Feb. 6....Minneapolis, Minn., Show, National Guard Armory, Minneapolis Automobile Trade Assn.
Feb.....Portland, Ore., Show, Portland Auto. Trade Assn.
Feb.....Toledo, O., Show, Toledo Auto Show Co.
Feb. 15-20.....Omaha, Neb., Show, Auditorium, C. G. Powell.
Feb. 22.....San Francisco, Cal., Vanderbilt Cup Race, Panama-Pacific Exposition Grounds; Promoter, Panama-Pacific Exposition Co.
Feb. 23-27.....Syracuse, N. Y., Show, Syracuse Auto. Dealers' Assn.; H. T. Gardner, Mgr.
Mar. 6-13.....Boston, Mass., Show, Mechanics Bldg., Boston Auto Dealers Assn., Boston Commercial Motor Veh. Assn.
Mar. 7.....San Francisco, Cal., Panama-Pacific Exposition, Grand Prize Race, Panama-Pacific Exposition Grounds; Promoter, Panama-Pacific Exposition Co.
Mar. 9-15.....Des Moines, Ia., Show, C. G. Van Vliet.
Mar. 14.....San Francisco, Cal., Panama-Pacific Cup Race, Panama-Pacific Exposition Grounds; Promoter, Panama-Pacific Exposition Co.

The Week in the Industry

Motor Men in New Roles

RECENT Changes in Indianapolis—Several changes have taken place in Indianapolis, Ind., trade circles. W. A. Roby, president, has bought the interest of his associate, H. L. Krieger, in the Electric Vehicle Service Station Co. W. W. Bond has been named by the Anderson Electric Car Co., Detroit, as district sales manager for the states of Indiana and Kentucky. L. C. Malott has been appointed manager of the William Small Co., distributors of the Chevrolet. D. B. Webster, formerly experimental engineer for the Hudson Motor Car Co., Detroit, has become assistant mechanical engineer for the National Motor Vehicle Co.

Downes Heads Locomobile Branch—F. H. Downes has taken charge of the new factory branch of the Locomobile Co., Portland, Ore.

Jones Resigns—W. G. Jones, until recently in charge of the service department of the Whitten-Gilmore Co., former Chalmers agent in Boston, has resigned.

Banta Sales Manager—H. A. Banta, who for some years past has been connected with Chanclor & Lyons Co., has joined forces with the Swan Carburetor Co., of San Francisco, Cal., in the capacity of sales manager.

Fickling Resigns—W. Irvine Fickling, for the past 4 years sales manager of the R. & L. Co., New York City, Eastern distributors of Garford trucks, has resigned and will shortly make an announcement of a new connection.

Adams Makes a Change—Al Adams, for 5 years manager of the used car department of the Joseph Donovan Co. in Boston, resigned last week to accept a similar position with the Auto Sales Co., on Worcester street, that city.

Bourne Double Fabric Manager—L. M. Bourne, for the past 6 years assistant production manager of the Goodyear Tire & Rubber Co., Akron, O., has been appointed factory manager for the Double Fabric Tire Co., Auburn, Ind. Mr. Bourne is an expert on rubber, and was in charge of the laboratories of the experimental department at the Goodyear plant.

Hayes Joins Pilot—E. O. Hayes, well known in the automobile trade through his former connection with the Midland, Velie and Imperial companies, is now traveling representative of the Pilot Car Sales Co., Richmond, Ind., in New England and New York.

Figman Indiana Truck Sales Manager—A. Figman, after 6 years' service with the Garford Co., New York City, has resigned to accept the office of sales manager of the Indiana Truck Co., Marion, Ind., with offices and service building at 250 West 54th street, New York City.

Fisher Chandler Branch Manager—John T. Fisher, well known formerly as a champion bicycle rider and later as an automobile driver, has been put in charge of the Chandler sales by the Northwestern Automobile Co., distributor in Minneapolis. Mr. Fisher has for three years been in charge of the Oldsmobile factory branch in Minneapolis.

Mass. State A. A. Election—The annual meeting of the Massachusetts State A. A. was held at Boston last week and President L. R. Spear, Vice-President John Coghlin and Secretary-Treasurer James Fortesque were unanimously re-elected. Reports were read by G. W. McNear, chairman of the legislative committee, and W. H. Chase of the good roads committee.

New Place for Gormley—G. B. Jeffery has resigned as advertising manager of the New England branch of the Firestone Tire & Rubber Co. at Boston, and he has been succeeded by C. J. Gormley.

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Garage and Dealers' Field

Change in Paige—The Paige is no longer handled in Boston by the Nettleton-Crittenden Co. That firm also handles the Chandler and it decided to devote all its time to that make. So a new company has been formed by Sherwood Hall. Jr., formerly with the Cadillac and Hudson agencies, to handle the Paige, and he has leased the salesrooms formerly occupied by the Studebaker retail agency at 889 Boylston street.

Distinct Branch Now—The J. I. Case T. M. Co. has made the Boston branch of the company a distinct branch, taking it away from under the jurisdiction of the New York branch and placing it in charge of J. J. Gormley, formerly manager of the Lozier in that city. It will control the New England territory.

$120,000 in Sales in Winnipeg—A general feeling of optimism is noticeable in Winnipeg motor circles by reason of the big demand for new cars at the late date. The sale of new cars by Winnipeg dealers has reached a total of over $120,000 during the month of October. Many of the sales have been made to farmers.

Franklin Gets Out New Paper—The Franklin Automobile Co., Syracuse, N. Y., has come out with its first edition of the "National Cooling Record." The first edition is 100,000. The paper shows some interesting scenes along the routes of the recent low-gear tests of that company and also some scenes of historical interest, showing Franklin No. 1, built in 1902.

Houpt and Studebaker Exchange Places—The Studebaker Corp., New York City, has leased the five-story building, northwest corner of Broadway and 56th street, covering a 50 by 120-foot plot, for a service salesroom, at an aggregate rental of $300,000. This building was formerly occupied by Harry S. Houpt, who has now taken the former Studebaker building at Broadway and 59th street.

Maxwell's Omaha Service Station—The Maxwell Motor Sales Corp., of Detroit, has leased a building on Ninth and Jones streets, Omaha, Neb., where they will open up a branch service station. Charles Gould, of Detroit, manager of the service, has been in Omaha during the week arranging the deal. Omaha will be service headquarters for a large territory, comprising the states of Nebraska, Wyoming, South Dakota, Colorado, Idaho and a part of the state of Iowa.

Automobile Agencies Recently Established

PASSENGER CARS

Iowa

Creston	Cole	L. M. Butts
Creston	Moon	J. F. Russell & Sons
Conroy	Glide	H. E Geiger
Cole	Moon	P. W. Bronhard
Drakeville	Moon	J. W. Thompson & Sons
Decorah	Moon	Kijome & Lynne.
Des Moines	King	Holsman Sales Co.
Des Moines	Moon	Means Auto Co.
Eagle Grove	Moon	Wm. Pletcher
Fort Dodge	Saxon	Bell & Kitterer
Independence	Oldsmobile	J. H. Wright
Keesaugua	Moon	E. W. Peacock
Madrid	Briscoe	Jones Auto Co.
Newton	Moon	Woody Auto Co.
Orange City	Oldsmobile	Wm. Van Pelt & A. Van Pelt
Riceville	Oldsmobile	Roche Bros.
Riverside	Haynes	H. F. Griffith
Sioux City	King	E. A. Christianson & Co.
Sully	Haynes	W. H. Holdsworth
Waterloo	Moon	Burd Auto Supply Co.
Tama	Moon	Thompson & Graham
Webster City	Moon	Parkhurst & Lavender
Whiting	Oldsmobile	A. B. Elliott

Kansas

Holyrood	Moon	C. L. Baker
Kiowa	King	Geo. B. Wilson
Sylvia	King	G. A. McPherson Auto & S. Co.
Wichita	Haynes	Wahl Motor Car Co.

Kentucky

Covington	Haynes	Madison Motor Car Co.
Louisville	Oldsmobile	Kentucky Auto Co.

Louisiana

Alexandria	King	J. D. Fuselier
New Orleans	King	August Stef
New Orleans	Saxon	W. P. Parkhouse Auto Co.

Maine

East Millinocket	Haynes	Chas. H. Pennings
Eastport	Oldsmobile	David Blanchard
Fort Fairfield	Haynes	H. G. Richards & Son

Maryland

Berlin	Oldsmobile	Murphy's Garage

Massachusetts

Boston	Ford	Ford Motor Co.
Charlton	Haynes	Frank Knight
Springfield	Moon	Moon Motor Sales Co
Worcester	KisselKar	E. J. Kehoe

Michigan

Alpena	Oldsmobile	Alpena Garage
Alpena	Studebaker	C. F. Steele
Bay City	Saxon	D. K. McKerlie
Detroit	King	King Motor Sales Co.
Eaton Rapids	Saxon	A. E. Ranney
Holland	Overland	Westrate & Brouwer
Howell	Saxon	R. E. Silsbee
Jackson	Dodge Bros.	Buell Auto Co.
Lakeview	King	C. C. Bollinger
Kalamazoo	Saxon	H. J. Cooper
Lansing	King	Henry L. Andrus
Mancelona	Hudson	Frank Harding
Mt. Pleasant	King	A. Z. Campbell

Accessories for the Automobilist

HARTFORD Economizer—A 35 per cent. saving in fuel is guaranteed to Ford owners by the use of the economizer announced by the Hartford Suspension Co., 172 Bay street, Jersey City, N. J. A decided increase in power is also claimed. This new device, shown in Fig. 3, supplies superheated air to the mixture as it comes from the carbureter. The hot air is introduced through a flange fitting which has a series of radial openings around its circumference so that the hot air issues into the intake passage in small jets. The effect of this, it is said, is not only to heat the mixture but also to break it up and mix it thoroughly, thus making the mixture perfectly homogeneous. In other words, vaporization is aided in two ways, the heat turns any small particles of liquid gasoline into vapor while the mechanical action of the hot jets of air, impinging upon the mixture rushing through, churns the mixture up and makes it uniform.

The air is heated by passing it through a stove which is clamped to the exhaust pipe, as illustrated. The intake to the stove is at the lower left corner, and from here the air passes back and forth two and one-half times before it issues from the pipe which leads to the intake. The total length of the path through the stove is about 2 feet, and therefore it is seen that the air is well heated.

According to the company, mileage tests on a Ford car with an ordinary carbureter adjustment show that without the economizer the average mileage per gallon at speeds averaging 20 to 25 miles per hour is 20.1, and with the economizer attached, but all other conditions left the same, the mileage per gallon registers 27.7, a gain of 37.8 per cent.

There is a valve controlled by a lever from beneath the steering wheel which regulates the amount of hot air, and it is claimed that with the economizer valve wide open and the throttle closed the maximum speed of the car is around 25 miles per hour, and that up to this speed the car should be operated entirely by the lever controlling the economizer, the throttle being closed.

The attachment of the economizer is a simple matter. Outside of a hole which must be punched in the pressed-steel fitting holding the steering column to the dash and bored through the dash, there is no work that cannot be done with a wrench.

First, the carbureter is removed and the economizer flange slipped in place with a gasket on either side. Then the long control lever is bolted to the steering column at the top, and at the bottom it slips over the steering-wheel shaft and the spark and throttle rods. From this point an adjustable rod connects with the valve on the economizer.

The price of the complete outfit is $10.

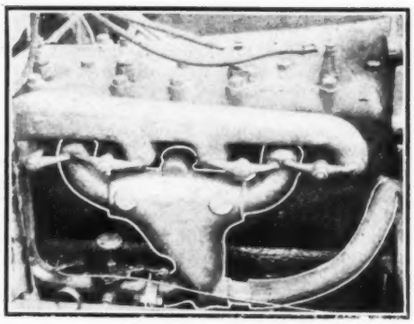

Fig. 1—Ford water-jacketed manifold

Spranger Wire Wheel with Demountable Rim—The feature of the wire wheel just announced by the Spranger Rim and Wheel Co., 705 Ford Bldg., Detroit, Mich., is that the rim is demountable and that any make of quick detachable rims may be used in connection with it.

The rim, Fig. 2, may be removed by loosening three bolts and no tool outside of any ordinary wrench is required to accomplish this. The rim is held in place by three sets of wedges, each operated by the bolts mentioned. As will be noted in the illustration, there are two metal blocks attached to the rim and when the rim is placed in the felloe, tightening the three screws draws up the wedge A which forces out the two arms B tightly against the two projections on the rim.

A further advantage of the new wheel, it is claimed, is that there is an air space between the felloe and rim which assists

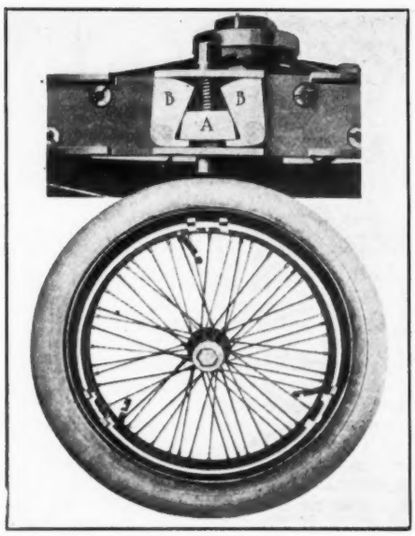

Fig. 2—Spranger wire wheel with demountable rim

materially in carrying the heat off from the tires. It is also stated that the new construction is several pounds lighter and that it is necessary for the owner to carry a spare rim only instead of a complete extra wheel.

Ford Water-Jacketed Manifold—Many advantages are claimed for the water-jacketed intake, Fig. 1, made by the Motor Devices Co., Mansfield, O., for Ford cars. According to the maker it not only gives a fuel saving of from 20 to 30 per cent., depending on the carbureter, but also gives increased power, speed and flexibility.

Gray & Davis Ford System.—A complete starting and lighting system for Ford cars, Fig. 4, has been brought out by Gray & Davis, Boston, Mass. Starting motor and lighting generator are distinct units, but they are compactly mounted in one casing, the motor being placed above the dynamo. In addition to these units a 6-volt battery, wiring, all the necessary connections and switches are included in the outfit.

Both units are connected to the crankshaft by means of silent chains. The motor is started by pressing a pedal and the lights are controlled by a switch

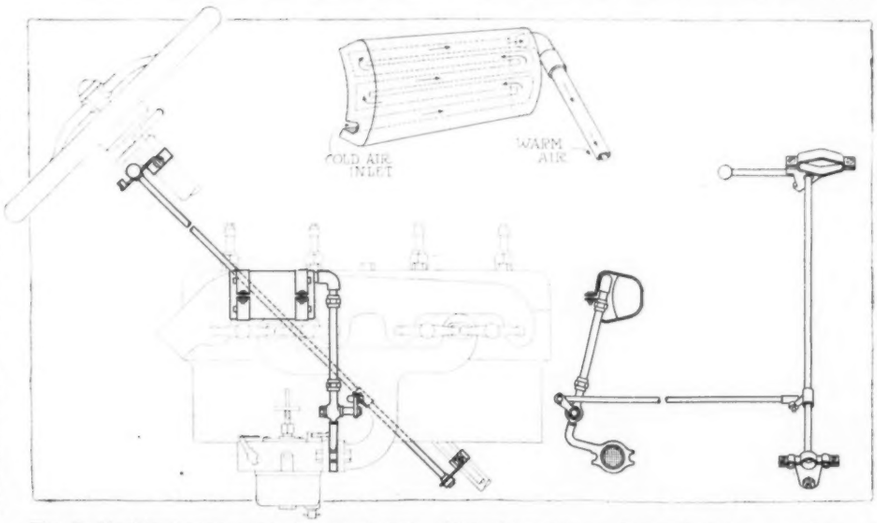

Fig. 3—Hartford economizer for Ford cars. Jets of hot air are drawn into the manifold. A 35 per cent. saving of fuel is guaranteed

Look at His Teeth

You can't tell by his ears how fast a horse can go or how much he can pull.

And there's no use judging a battery by the way it looks—you've got to know something about *what's inside.*

Your starting and lighting systems depend on good "juice," and good "juice" depends on good batteries, good batteries depend on good manufacturers, and good manufacturers depend on good will.

We have the good will of 85% of United States motor car manufacturers. They have found out *what's inside* of the LBA. Have you?

Willard Storage Battery Company

Cleveland, Ohio

New York Branch: 136 W. 52nd St.
Chicago Branch: 2524-2530 S. Wabash Ave.
Detroit Branch: 736-740 Woodward Ave.
San Francisco Branch: 243 Monadnock Bldg.
Indianapolis Branch: 438 and 439 Indiana Pythian Bldg.

Service Stations in All Principal Cities in the United States, Canada and Mexico

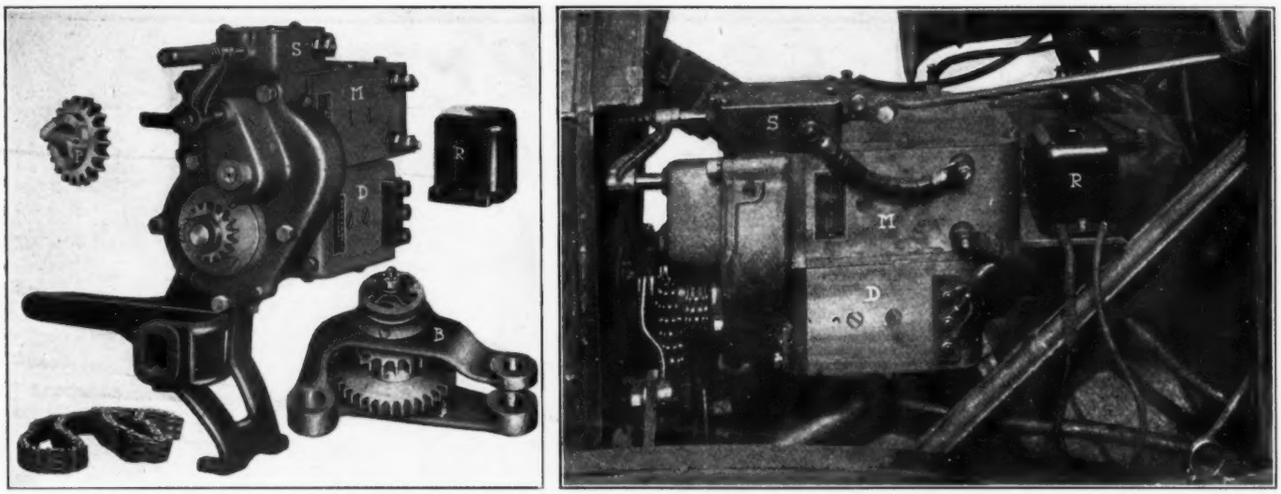

Fig. 4—Gray & Davis starting and lighting system for Fords. Right—System attached to Ford. Left—Details of system. R is the regulator, P the driving sprocket, B the bracket, M the motor, S the switch, and D the dynamo

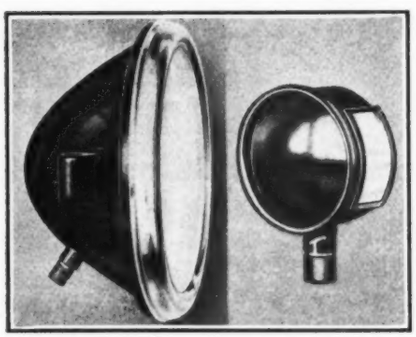

Fig. 5—Left—Gray & Davis Ford headlight. Right—Ford tail light

within easy reach on the dash. It is stated that the only attention required is occasional lubrication and addition of distilled water to the battery every 2 weeks.

To go with this new system this company is manufacturing electric head and tail lamps. These are shown in Fig. 5.

Thor Electric Drills—Four types of electric drills adapted for automobile repair work are manufactured by the Independent Pneumatic Tool Co., Chicago, Ill., under the name of Thor. These vary in capacity from 0 to 1-4, 0 to 5-16, 0 to 3-8 and 1-8 to 9-16 inches. The first is adapted for sheet metal work, drilling holes in frames, fenders and boring in wood up to 3-8 inch in diameter. The second size is used for the same work as the first, but it has a greater capacity. The third size is especially adapted for automobile body work, while the fourth, Fig. 6, is for general use in garages.

Ball bearings are used on the armature shaft and roller bearings on the spindle. The pinion on the armature shaft is removable. An improved type of switch is fitted, and the brushes are accessible. Any of these drills may be had for a 10-day free trial.

Compton Air Starter—An air-starter system, Fig. 7, is being put forth by the American Motor Utilities Co., New York City, which is featured by an automatic control which may be used in connection with any air pump maintaining the pressure at any predetermined point.

The starter unit is an air motor which has no dead center. It is stated that it develops a constant shaft torque of 3,200 inch pounds when operating under 100 pounds pressure.

Special care has been taken in designing the valves so that they will hold the pressure. All valves are brass seated when either open or closed, thus obviating stuffing boxes which may leak. All joints are ground brass unions attached to flaring ends of copper tubing, eliminating brazing and soldering.

The system is adaptable to big and little cars. The starter is installed at the side of the engine underneath the hood. Through the hollow starter shaft a smaller diameter shaft extends, from a sprocket wheel at the driven end, connected by silent chain drive to engine shaft, to a clutch at the driving end, which is brought into engagement with pump shaft and disengaged instantly and automatically as the air pressure falls below or is increased to predetermined points, respectively.

A pneumatically-operated roller bearing thrust clutch, provided with back-fire release, engages the air starter with shaft, driving or rotating the engine shaft the instant the starting valve is pushed downward. When explosions take up the propulsion the starter clutch is automatically thrown out of engagement, the sleeve shaft of starter remaining idle until the operation is repeated to again start the motor. The smaller shaft, passing through but not touching the sleeve shaft of starter, is brought into engagement with the pump shaft by the automatic control and restores the air pressure in storage tank to its maximum again, when the pump is automatically disengaged. The motor is started by pressing a button.

The air tank, which is 8 by 42 inches, may be located under the car. Sixty pounds pressure is all that is necessary to operate the biggest motors, but the maximum pressure generally carried in tank is 150 pounds for large cars and 80 pounds for cars of the Ford type. The automatic control is adjustable, so that it may be set in a moment to operate at any desired maximum and minimum pressures. An outlet at the pump, with hose connections, is also provided for inflating the tires.

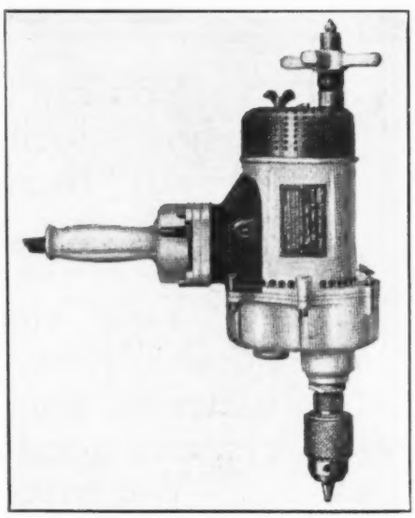

Fig. 6—One type of Thor electric drill

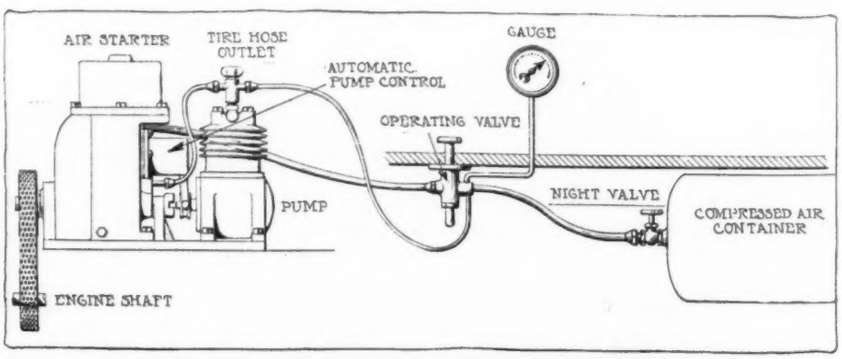

Fig. 7—Compton air starter installed on a car. Any make of pump may be used